

The Economist

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Pope Francis's radical year

Ohio's law against lies

Why has the world stopped warming?

The great prostate controversy

Kidnapped by the Kremlin



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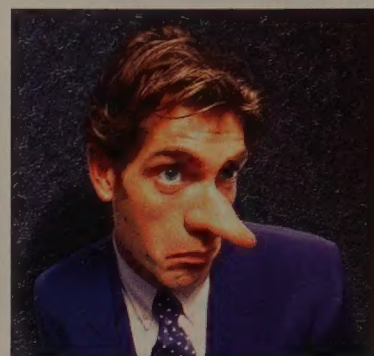
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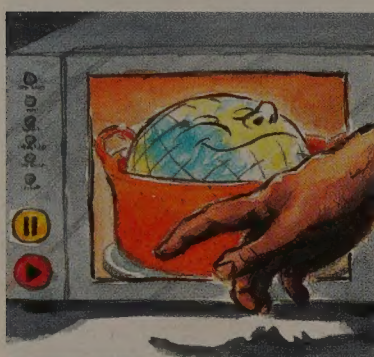
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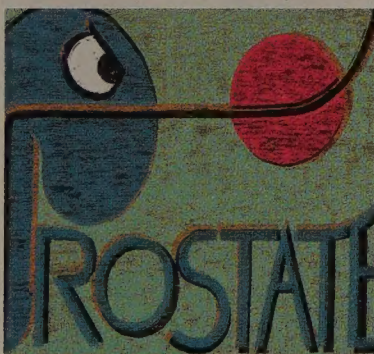


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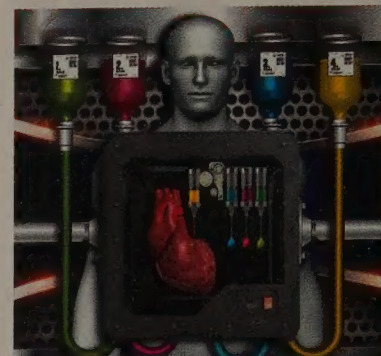
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Technology Quarterly

With articles on the latest emerging technologies including 3D-printing human tissue, drone ships, the future of chipmaking, conductive fibres, making things with viruses and much more, after page 48

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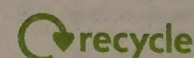
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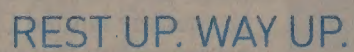
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Politics



Russia took de facto control of Ukraine's southern autonomous region of **Crimea**, as unidentified Russian troops grabbed command of key strategic points following the upheaval that accompanied Viktor Yanukovich's ousting as Ukrainian president. The troops surrounded military bases in the majority Russian-speaking region, as well as the airport. The Crimean parliament voted to leave Ukraine and join Russia, and to put the issue to a referendum on March 16th.

Russia's foreign minister, Sergei Lavrov, met his counterparts from America and Europe in Paris to try to resolve the crisis. America pushed for independent monitors in Crimea and direct talks between Kiev and Moscow. Earlier the European Union offered €11 billion (\$15 billion) of aid to **Ukraine** and froze the assets of several prominent Ukrainians.

Cyprus came a step closer to receiving the next tranche of its €10 billion (\$14 billion) bail-out from the EU and IMF, when the Cypriot parliament passed an amended bill that will privatise utility companies, with the unions given a larger say in the sale.

Britain's Labour Party weakened its institutional links to unions by, among other things, changing the way it selects its leader to a simple one-person-one-vote system. Ed Miliband, Labour's leader, risked the unions' ire by putting forward the proposals; he won the leadership in 2010 largely because of their support.

Secret recordings were posted on a website of **Nicolas Sarkozy** discussing the sacking of ministers when he was president of France. The recordings were taken by a former adviser, causing outrage in Mr Sarkozy's centre-right party. More revelations will be dripped to the media in coming weeks, possibly hurting Mr Sarkozy's chances of a comeback for the presidency in 2017.

Only the beginning

The White House presented its **budget** request for the next fiscal year to Congress. The blueprint asks for more spending on programmes to reduce inequality, such as \$76 billion on child education and an expansion of the Earned Income Tax Credit. Next year's budget deficit is forecast at \$564 billion, or 3.1% of GDP.

The White House also announced yet another delay for **Obamacare** by allowing Americans to keep insurance that does not comply with the new rules for two more years. This will stop insurers cancelling individuals' health plans just before the mid-term elections, which would have been bad news for the Democrats.



Tea Party-backed candidates mostly lost out in Republican congressional primaries in **Texas**. In the governor's race Greg Abbott (above) won the Republican primary and Wendy Davis claimed victory in the Democratic one. They will face each other in November's election.

Over here!

While **Israel's** prime minister, Binyamin Netanyahu, was on a visit to America, his spokesmen boosted his campaign against an American interim

deal with **Iran** by announcing that Israel's navy had captured rockets with a range of 200km (124 miles) that had apparently been dispatched from Damascus via Iran. They were said to have been heading for Port Sudan and then to the Gaza Strip, which abuts Israel.

In one of the worst rows among Gulf states in recent years, **Bahrain, Saudi Arabia** and the **United Arab Emirates** withdrew their ambassadors from **Qatar** after alleging that the gas-rich Gulf state, which has supported the Muslim Brotherhood in Egypt and elsewhere, had been meddling in its neighbours' internal affairs. The Qataris expressed "regret and surprise".

Field-Marshal Abdel Fattah al-Sisi, the power behind **Egypt's** government, came close to announcing his candidacy for president, by telling a gathering at a military academy that "procedures will be finalised over the coming days...I cannot turn my back when the majority wants me to run for president."

Gunmen suspected of belonging to **Nigeria's** Boko Haram Islamist terrorist group rampaged through villages in the north-east of the country, killing scores of people over several days.

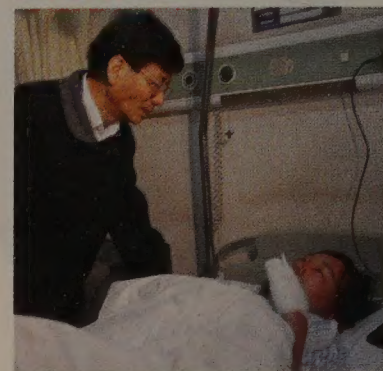
The legacy

Venezuela marked the first anniversary of the death of Hugo Chávez. President Nicolás Maduro lauded Chávez's achievements in a ceremony in Caracas; opposition protesters continued with their rolling demonstrations. Mr Maduro broke off ties with **Panama**, which had requested a debate at the Organisation of American States on the political unrest in Venezuela.

Pauline Marois, whose Parti Québécois has led a minority government in **Quebec** since 2012, called a snap election for April 7th. With polls suggesting the PQ will win a majority, the question of the province's secession from Canada could soon be back on the table.

If at first you don't succeed, quit. Johnny Araya, the candidate of the governing centrist party, abandoned campaigning for **Costa Rica's** presidential election. He is heavily trailing the left's Luis Guillermo Solís in a run-off vote on April 6th.

Horror attack



Eight assailants wielding knives killed 29 people and injured about 140 in an attack at the train station in Kunming, a city in south-western **China**. Officials blamed separatists from the Uighur ethnic group. Uighurs are Muslims from the north-western region of Xinjiang, many of whom want an independent state of East Turkestan. America's State Department described the attack as an act of terrorism.

At least 11 people were killed in an attack at a court in Islamabad, **Pakistan's** capital. Gunmen burst into the building and opened fire before suicide-bombers detonated explosives. The assault came after the Pakistani Taliban pledged a month-long ceasefire and the government said it would suspend air strikes against militants. That deal came under yet more pressure when at least six Pakistani soldiers were killed in a bombing.

In **Afghanistan** at least five Afghan soldiers died after being caught up in a NATO air strike. NATO is carrying out an investigation.

India's election commission announced that a general election will take place in nine phases between April 7th and May 12th, with votes counted on May 16th. India's 814m voters will make this the largest election ever to take place. ►►

Business

Russia's RTS index, \$ terms
September 1st 1995=100



Global stockmarkets fell sharply in response to Russia's intervention in Ukraine, and then rallied as the threat of a full-scale invasion receded. The rouble tumbled to an all-time low against the dollar, prompting the Russian central bank to jack up interest rates from 5.5% to 7%. The Russian currency has lost around 10% of its value since the start of the year, leading to fears of an inflationary spike in the weakened Russian economy.

China kept its target for annual GDP growth at 7.5%. For much of last year the economy looked as if it might miss that target until a strong fourth quarter boosted annual GDP to 7.7%. Many economists think the figure will be harder to reach this year, unless the government eases restrictions on lending.

Standard Chartered, a bank based in London that reaps most of its income from Asia, reported a pre-tax profit of \$6.1 billion for 2013, which was 11% lower than in 2012 and its first drop in profit for ten years.

Freeing the flying kangaroo

Australia's government announced that it wants to scrap rules that cap foreign ownership of Qantas, the country's biggest airline, at 49%. Tony Abbott, the prime minister, said the carrier will be freer to compete if it is "unshackled and un-propped up by government". Qantas recently reported an underlying loss of A\$252m (\$224m) for the half year to December and announced 5,000 job cuts. It has struggled to compete on its international routes with the

new crop of airlines from the Gulf states, and with Virgin Australia on its home turf.

The Bank of England suspended a member of staff amid an internal review into allegations that officials at the central bank condoned or were informed of manipulation in the foreign-exchange market. It said it had found no evidence so far that any of its employees colluded in rigging rates, but was suspending a staff member while it investigates whether "rigorous internal control processes" were followed. Separate investigations have led to more than 20 traders at several commercial banks being either sacked or suspended.

The Japanese government prepared to draw up plans to regulate Bitcoin and tax transactions involving it, following the collapse of the Tokyo-based Mt. Gox exchange and various hacking incidents.

A federal judge in Manhattan ruled that a penalty imposed against Chevron in Ecuador for polluting local villages had been "obtained by corrupt means". The decision gives Chevron ammunition in its long-running legal battle over allegations that Texaco, which

it took over in 2001, caused the pollution. The American oil giant has been ordered by an Ecuadorean court to pay \$9.5 billion. This week's ruling found that the order had been secured through bribery and coercion by the plaintiffs' lawyer in New York.

Old versus new

Vivendi, a French media conglomerate, received two bids for SFR, a telecoms operator, ahead of a deadline it had set for offers. The bids are from Bouygues, a blue-chip industrial group, and Altice, a cable-TV and mobile-telecoms company backed by Patrick Drahi, a French-Israeli telecoms entrepreneur. Any deal would be scrutinised by Europe's antitrust regulators, but also by the French government, which has made it clear it will not tolerate job cuts.

RadioShack's troubles deepened, when it revealed that its sales in the last three months of 2013 were down by a fifth compared with the same period a year earlier. The American electronic-goods retailer is to close 1,100 stores, which still leaves it with around 4,150 bricks-and-mortar locations. The glory days in the 1980s are long gone. Its share price plunged by 17%

after it reported its earnings, leaving it with a market valuation below \$230m.

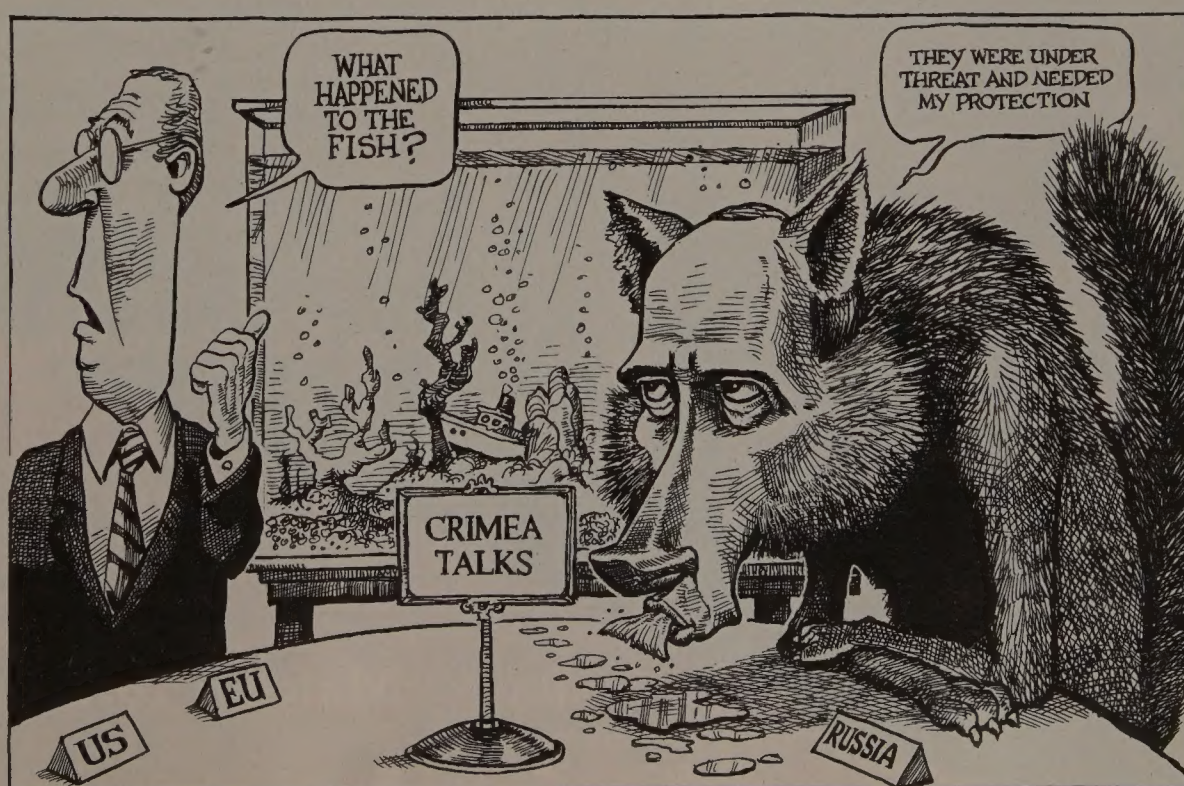
Global shipments of personal computers fell by 9.8% in 2013, according to IDC, a market-research firm, the biggest decrease in its tracking survey. PC shipments were forecast to decline by 6.1% this year.

Eurostar, which runs trains through the tunnel connecting Britain and France, carried 10m passengers last year for the first time since it began operating in 1994. Eurostar is thriving partly because of the "demand for services from business travellers, particularly those based in the UK where the recovery has a stronger foothold."

Worth a bob or two

Bill Gates reclaimed his crown as the world's richest man by topping the Forbes list for the first time in four years. The Microsoft founder has a net worth of \$76 billion. Carlos Slim, a Mexican telecoms tycoon, fell to second place with \$72 billion. Mark Zuckerberg was the biggest gainer; his Facebook shares helped propel him to 21st in the ranking, with a net worth of \$28.5 billion.

Other economic data and news can be found on pages 92-93





Pandemic

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Meet **Alessandro Vespignani**, a pioneer in the network science of infectious disease outbreaks. Using data sources such as airline traffic and cellphone usage, Professor Vespignani creates maps of human mobility, yielding computational models with the predictive power to transform global public health policy.

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Kidnapped by the Kremlin

The West can punish Putin's Russia for its belligerence in Ukraine. But only if it is prepared to pay a price



AS YOU read this, 46m people are being held hostage in Ukraine. Vladimir Putin has pulled Russian troops back from the country's eastern border. But he has also demanded that the West keep out and that the new government in Kiev should once again look towards Russia. Don't be alarmed, he says with unambiguous menace, invasion is a last resort.

Some in the West will argue that the starting point for policy is to recognise reality, however unpalatable. Let Mr Putin keep the Crimean peninsula, which he occupied just over a week ago. It has a Russian-speaking majority and was anyway part of Russia until 1954. As for Ukraine as a whole, Russia is bound to dominate it, because it cares more about the country than the West does. America and the European Union must of course protest, but they would do well to avoid a useless confrontation that would harm their own economies, threaten their energy supplies and might plunge Ukraine into war. Mr Putin has offered a way out and the West should grasp it.

That thinking is mistaken. In the past week Mr Putin has trampled over norms that buttress the international order and he has established dangerous precedents that go far beyond Ukraine (see page 22). Giving in to kidnappers is always dangerous: those who fail to take a stand to start with often face graver trials later on.

In another world

The Ukrainian citizens who protested in Maidan did not drive out a home-grown autocrat only to become beholden to the one next door; many of the youths on the streets of Donetsk and Kharkiv, in the Russian-speaking east, are as eager to belong to a sovereign Ukraine as are their compatriots in Kiev and Lviv. They know that under Russia's sway Ukraine would be weak and dependent. They look westward to Europe, which offers their country its best hope of overcoming chronic corruption and bolstering the economy.

Crimea seems inclined to turn eastward instead; and if its people voted for an orderly secession, it might well get the backing of the outside world. But the referendum that has been announced for March 16th is being held at the point of a Kalashnikov. Moreover, the justification Mr Putin claims for sending in troops is not Crimea's unique history, but the principle that the Kremlin has a duty to protect Russians and Russian-speakers wherever they may be—the logic that Hitler used when he seized parts of Europe in the 1930s. If the West implicitly accepts this line, Mr Putin will have a pretext for intervening to protect Russians scattered across the former Soviet Union, from Central Asia to the Baltic.

Many powers, not least Britain, France and the United States, have sometimes broken international law. But Mr Putin has emptied the law of significance, by warping reality to mean whatever he chooses. He has argued that fascists threaten the safety of Russian-speakers in Ukraine; that the elite troops surrounding Ukrainian bases are not Russian, but irreg-

ulars who bought their uniforms in the shops; that the Budapest memorandum, which Russia signed in 1994 and guarantees Ukraine's borders, is no longer valid because the government in Kiev has been overthrown. Such preposterous claims are not meant to be taken at face value. Instead they communicate a truth that ordinary Russians understand only too well: the law is there not to restrain power, but to serve it. Unchallenged, this is a licence for Russian aggression.

So do not bet on Mr Putin being content to stop at Ukraine. In 2008 he fought Georgia to assert control of Abkhazia and South Ossetia. He has said that the collapse of the Soviet Union was the 20th century's greatest geopolitical catastrophe. He is armed with a self-proclaimed mission to rebuild the Russian empire and now with a pretext to intervene abroad. Unconstrained by law or the fear that the West will stand up to him, Mr Putin would pose a grave threat to his neighbours.

You say Kiev, I say Kyiv

The West is not about to go to war over Ukraine, nor should it. Not enough of its interests are at stake to risk a nuclear conflict. But the occupation of Crimea must be punished, and Mr Putin must be discouraged from invading anywhere else.

Mr Putin expects a slap on the wrist. Sanctions must exceed his expectations. Shunning the G8 summit, which he is due to host in June, is not enough. It is time to impose visa bans and asset freezes on regime-connected Russians (the craven parliamentarians who rubber-stamped their army's deployment should be among the first batch); to stop arms sales and cut Kremlin-friendly financial firms from the global financial system; to prepare for an embargo on Russian oil and gas, in case Ukrainian troops are slaughtered in Crimea or Russia invades eastern Ukraine. And the West should strengthen its ability to resist the Kremlin's revanchism: Europe should reduce its dependence on Russian gas (see page 28); America should bin restrictions on energy exports; NATO should be invigorated.

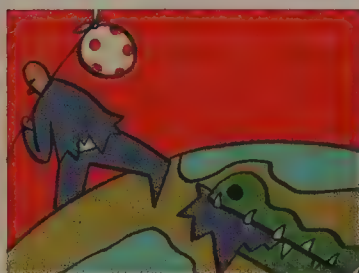
Ukraine needs aid, not only because it is bankrupt, but also because Russia can gravely harm its economy and will want to undermine any independent-minded government. America and the EU have found some billions in emergency funds, but Ukraine also needs the prospect, however distant, of EU membership and a big IMF package along with the technical assistance to meet its conditions. A vital start is a monitored election to replace today's interim government and the parliament, which is for sale to the highest bidder.

As things stand, mindful of their fragile economies, and with the Kremlin hinting at revenge against sanctions, many Europeans worry about the cost of all this (see page 56). But Mr Putin will gauge whether the West is resolute about its eastern borders partly by the price it is prepared to pay. Others argue that the West needs Russia to help deal with Syria and Iran's nuclear programme. But Russia is fuelling the war in Syria, and it has just torn up the deal that promised Ukraine security after it surrendered its nuclear weapons—a terrible precedent. For too long Western leaders have hoped that their countries' economic ties with Russia could be impervious to the Kremlin's belligerence. This week Mr Putin proved them wrong. ■

Business in emerging markets

Submerging hopes

The boom in emerging-market investment by rich-world firms has led to plenty of disappointment



IN 2007 UniCredit, an Italian bank, fought off ferocious competition from other Western lenders to buy Ukraine's fourth-largest bank from an oligarch for a queasy \$2 billion. This week, amid talk of war and default, UniCredit limited withdrawals

from its ATMs in Ukraine. At the same time, the shares of firms that are big in Russia, such as Carlsberg and Renault, fell.

The turmoil in Ukraine is one of a host of troubles that Western firms are facing in emerging markets. Slowing growth, falling currencies, weak commodity prices, bad investment decisions and that catch-all of a thousand corporate woes, political risk, have combined to disappoint managers' expectations. Investors have noticed: rich-world firms with above-average exposure to emerging economies have lagged America's stockmarket by about 40% over the past three years.

All this is leading firms to re-examine their emerging-market strategies (see page 65). For many, although the experience has been tough, the prospects are good. But some have wasted enough shareholders' money, and should head home.

So very 1990s

The corporate world is just as susceptible to fashion as the high street. In the late 1990s the e-commerce bubble seduced all but the most sensible firms. In the mid-2000s the private-equity industry declared that the listed company was dead. But far more powerful than either of those trends has been the belief that Western firms should pile into emerging markets.

The boom dates from the 1990s, when the Berlin Wall had fallen, India opened up and China began to prosper. Firms invested in emerging markets first to manufacture goods for sale in rich countries, and then to sell their products to increasingly affluent new middle-class consumers. The financial crash and subsequent recession in the West only sharpened their enthusiasm for foreign adventures.

The volume of takeovers by rich-world firms in developing countries more than quadrupled between 2003 and 2010, to \$180 billion. Rich-world firms have invested some \$3 trillion in emerging economies, making it one of the biggest corporate-investment cycles since the railway boom of the 19th century. Parisian cognac distillers, Japanese male-cosmetics firms and cranemakers in Illinois have all jumped in.

These investments have transformed the structure of many firms. In 1999 Unilever said the rich world was its "backbone". Now most of its shampoos, soaps and soups are sold in developing countries. Boeing sells more planes in China and Latin America than it does in Europe. Salesmen for Germany's *Mittelstand* wine and dine clients in Chengdu as well as Cologne. Research operations have been rejigged to create more products for poor people. Executives with emerging-market experience have shot through the ranks.

The developing world promised spectacular riches. But on average the return on capital multinational firms are making in emerging markets has been mediocre—no higher than the glo-

bal average. Many firms are not getting adequate reward for the risks they are taking. Some have lost a ton of money.

So what went wrong? In their enthusiasm to get into emerging markets, plenty of companies did not take the risks involved seriously enough. Russia's move into Crimea may have been a shock, but—after a similar move into Georgia in 2008—it was hardly a surprise. Governments tend to play rougher in emerging markets. A Spanish oil firm, Repsol, had its assets in Argentina expropriated (on February 26th it agreed to a compensation package). India's tax officials have tried to kneecap Vodafone, Nokia and IBM, among others.

Mostly, though, bad management was to blame. Too many firms overpaid for acquisitions. The average valuation in 2007 was double that in 2002-03. Others plunged into markets that were saturated. In Brazil carmakers have at least 20% excess capacity and vehicle sales fell last year. At least 20 of the world's insurers are squabbling over the tiny slice of India's insurance market that is not state-controlled. Some industries, such as pharmaceuticals, found their old business models did not work in poorer places and failed to invent new ones.

Chief executives tend to believe that they would be mad to cut their emerging-market exposure. After all, the firms that quit Asia after its crisis of 1997-98 made a big mistake. But foreign firms face far more formidable local competitors than they did then. And struggling multinationals should not assume that when economic growth recovers it will be as fast or as widespread as in the past. A decade of low interest rates and rampant Chinese demand allowed almost all developing countries to grow at turbocharged rates—even those that were badly run. Now the global environment is less forgiving.

Time for a clear-out

To improve their fortunes in emerging markets, rich-world firms need to take two steps. First, they should screen their portfolios for strategic relevance and financial returns. Businesses that have weak returns or are peripheral are candidates to be sold, restructured or shut. The car and natural resource industries have started to do that. A few firms will need more radical surgery. Some bailed-out banks have left; big supermarket chains such as Carrefour and Tesco are in retreat.

Second, multinationals will need to strengthen the operations they retain. By borrowing in local debt markets and shifting more production to the emerging world, they can create a hedge against currency turbulence and ward off protectionism. The strongest firms should consider acquisitions to boost their market shares—but make sure they do not overpay.

Eventually growth in the emerging world will pick up, rewarding firms with strong businesses and persistence. But the stampede of Western firms into those markets will not be repeated. Instead the traffic is likely to go the other way. Emerging economies generate 40% of global GDP, measured at market exchange rates, but their firms own only 19% of cross-border investment and (say consultants at Interbrand) just four of the top 100 brands. In the next decade, more emerging-market firms will snap up rich-world assets. And you can be sure that trend will lead to plenty of duff decisions, too. ■

China's restless West

The burden of empire

After a brutal attack in China, the Communist Party needs to change its policies towards minorities



A GROUP of knife-wielding assailants, apparently Muslims from western China, caused mayhem and murder on March 1st in the south-western Chinese city of Kunming, stabbing 29 people to death at the railway station and injuring 140

others. The attack has shocked China. The crime against innocents is monstrous and unjustifiable, and has been rightly condemned by the Chinese government and by America. But as well as rounding up the culprits, the Communist Party must face up to an uncomfortable truth. Its policy for integrating the country's restless western regions—a policy that mixes repression, development and Han-Chinese migration—is failing to persuade non-Han groups of the merits of Chinese rule.

The party says the attackers were “Xinjiang extremists”, by implication ethnic Uighurs, a Turkic people with ties to Central Asia who once formed the majority in the region of Xinjiang. The killers may have been radicalised abroad with notions of global jihad. Whatever the truth, there is no doubt that Uighurs are committing ever more desperate acts. Scarcely a week passes in Xinjiang without anti-government violence.

The party claims that Xinjiang has been part of China for 2,000 years. Yet for most of that time, the region has been on the fringe of China's empire, or outside it altogether. An attempt to incorporate these lands began only with the Qing dynasty's conquests in the mid-18th century. (The name Xinjiang, “new frontier”, was bestowed only in the 1880s.) During the chaos of the 1940s, Uighurs declared a short-lived independent state of East Turkestan. But from 1949 the Communists began integrating Xinjiang into China by force. Demobbed Chinese soldiers were sent to colonise arid lands, the state repression of Uighurs drawing heavily on the Soviet tactics for handling “na-

tionalities”. Uighur resentment of the Han runs deep. The feeling is mutual. Many Chinese are openly racist towards Uighurs, and the government thinks them ungrateful. In 2009 hundreds of people were killed during street fighting between Uighurs and Han, who now make up two-fifths of Xinjiang's population and control a disproportionate share of its wealth.

Identity crisis

The Kunming killers' motives may never be known. But fears of militant Islamism arriving at the heart of China must not obscure the broader problem of Chinese oppression in Xinjiang. Recent crackdowns hit at the heart of Uighur identity: students are banned from fasting during Ramadan, religious teaching for children is restricted, and Uighur-language education is limited. Many Uighurs, like their neighbours in Tibet, fear that their culture will be extinguished. Xinjiang and Tibet (and Inner Mongolia) are still China's colonies, their pacification under the Communist Party a continued imperial project. Were it not for the Dalai Lama's restraining influence, violence in Tibet might be as bad as it is in Xinjiang. As it is, over 100 Tibetans have burned themselves to death in protest at Chinese rule.

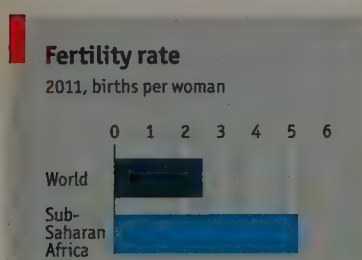
There is a large military presence in China's west. The government seems to believe that unless Uighurs and Tibetans are held in check by force, the western regions could break away. That is always a danger. But suppression, which leads to explosions of anger, may increase the risk, not mitigate it.

The only way forward is to show Uighurs (and Tibetans) how they can live peacefully and prosperously together within China. The first step is for the party to lift the bans on religious and cultural practices, give Uighurs and Tibetans more space to be themselves, and strive against prejudice in Chinese society. Economic development needs to be aimed at Uighur and Tibetan communities. Otherwise, there will be more violence and instability. ■

African demography

Fertility treatment

Birth rates are not falling in Africa as fast as they did in Asia. More contraception would help



THROUGHOUT most of the developing world, falling fertility has been a quiet, almost stealthy force improving people's lives. Because it is easier to educate two children than five, lower fertility goes hand in hand with higher skills and in-

creased earning power in the next generation. With fewer dependent children, countries experience several generations in which working-age adults make up a disproportionate share of the population. That makes possible a “demographic dividend” of higher growth and rising incomes.

But one part of the world is missing out on the dividend: the swathe of Africa that lies south of the Sahara and north of Namibia and Botswana. Although this belt is enjoying economic growth, countries within it are not seeing their fertility rates fall by as much as happened in East Asia and Latin America when those regions were at a similar level of development (see page 49). In some African countries, such as Niger, fertility remains sky-high; in others, such as Ghana and Tanzania, fertility began to fall, then stopped.

With fertility, small variations build up to make a huge difference over time. In 1970, there were 360m Africans and they amounted to a tenth of the world's population. If fertility were to drop roughly in line with Asia's 1970-2000 trajectory, there ►►

► would be 2.1 billion Africans by 2050. If it continues on its current path, there will be 2.7 billion—a quarter of the global population then. Africa's population will almost triple in 40 years.

This extra half-billion people will damage Africa's prospects. The continent will find it hard to educate the next generation—and education is the most important step in realising the demographic dividend. By 2050, there could be twice as many Africans below 14 years of age as there are now. Despite a decade of growth, the continent is not generating enough jobs in the formal economy to finance education properly. And if population growth and urbanisation continue at their current pace, the continent's big cities could become ungovernable. Kinshasa could have 30m people by 2050; Lagos, 40m. That would make them larger and harder to manage than China's giant cities are now.

There are many possible explanations for Africa's continued high fertility. Africa is less densely-populated than Asia, and its wide-open spaces may lead societies to feel that they need to have lots of children to defend their territory from

more numerous rivals. Many Africans have communal social arrangements which mean that the costs of having extra children fall on the village rather than the family. But another likely reason is that modern family-planning services are not widely available. And this can be changed.

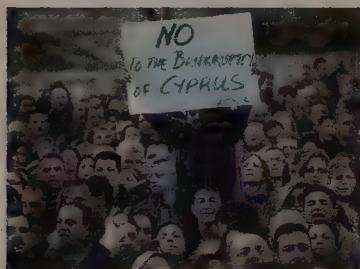
In most developing countries, 60% of women of childbearing age have access to modern contraceptives. In much of Africa, the rate is 20%. There is a clear link between the provision of contraception and lower fertility. Uganda and Tanzania have roughly the same income per head, but Uganda's government—until recently—discouraged family planning, and the country has a significantly higher fertility rate. Somalia and Eritrea have roughly the same income per head, but Eritrea provides some family planning and has much lower fertility.

Modern contraceptives are a cheap way to reduce maternal deaths from dangerous abortions. They free parents from the burden of unwanted pregnancies. And they help create lower-fertility, higher-income societies that benefit everyone. African governments should provide them universally. ■

European bank rescues

Cyprus one year later

Getting creditors not taxpayers to rescue banks seemed like a good idea, but it has not worked well in Cyprus



NOTHING has infuriated taxpayers more in recent years than the bailing-out of banks. The cost has been colossal: €592 billion (\$800 billion) of European taxpayers' money went into teetering banks between 2008 and 2012. Moves to make

such bail-outs a last rather than a first resort have therefore been welcomed. From 2016 losses from bank collapses in Europe will be met as far as possible by the banks' creditors.

Cyprus has already provided a year-long test of this "bail-in" approach. The results are discouraging (see page 73). The economy is on course to shrink by 5% this year after a similar decline in 2013, and unemployment has climbed to 17%. Cyprus's experience should serve as a warning against too violent a swing away from bail-outs, in Europe and beyond, and as a reminder of why banks have previously been rescued.

Distributing the pain

Amid tough competition, Cyprus's banking crisis was a contender for Europe's worst. The botched rescue a year ago was surely the nadir of an unimpressive record of decision-making by European finance ministers and the IMF. At first, a raid on insured deposits was envisaged, though ultimately they were spared and the main victims were uninsured depositors—a decision made easier by the fact that many of them were Russians. But getting creditors both to absorb losses and to recapitalise the country's biggest bank (which also had to absorb the second-biggest and even more comprehensively bust bank) is not proving to be a great success.

The resulting bank, which is dominant in Cyprus, is a blighted behemoth. Though its capital ratio looks respectable, payments are late on half of its lending book. With the Cypriot economy shrinking and the property market still overvalued,

more loans will turn sour. And the bank's loans are half as big again as its deposits. That leaves it dependent on emergency central-bank funding and unfit to provide the flow of credit that the economy needs if it is to recover.

Three lessons can be learnt from the Cypriot saga. The first is the importance of having a state-backed "bad bank" into which the bad loans of a restructured bank can be placed. These asset-management companies lift the weight of bad loans off the books of banks, at a big discount to their value when they were extended, freeing banks to provide credit for new ventures. Because these asset managers can operate on a longer horizon than banks, they can avoid distress sales. NAMA, the Irish version, concentrated at first on selling off assets in Britain, where property recovered faster than in Ireland.

Second, getting uninsured deposits to take much of the pain may help protect taxpayers, but in Cyprus it has destroyed public faith in banks. Big depositors everywhere will be more nervous as a result, with money taking flight at the first whiff of danger. It was precisely worries about bank runs that have made states reluctant for so long to hang banks out to dry. If bailing-in is to work, it should target longer-term debt that cannot be withdrawn and investors who can factor in the risk of a bust. This makes it vital that regulators promote innovations like contingent convertible bonds (or "cocos"), forms of debt that explicitly envisage bail-in.

The third lesson is that attempts to set rigid templates are likely to rub up against the crooked timber of banking. Politicians in America as well as Europe are imposing binding rules to limit public liability and to discourage risky behaviour on the part of banks. But banking crises vary: some threaten a systemic collapse whereas others are containable. There must be flexibility to deal with the worst-case contingencies. Cyprus's difficulty in overcoming recession while its main bank is in such a mess should serve as a warning against strict solutions that smack of puritanism rather than pragmatism. ■

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Dividing Ukraine

SIR – What is so special about the current borders of Ukraine (“Europe’s new battlefield”, February 22nd)? Why does the country need to be kept intact? Scotland will vote on whether to leave the United Kingdom. Canada has survived two referendums that would have led the province of Quebec to independence.

The autonomous region of Crimea has only been a part of Ukraine since 1954. It is one of several areas in the country where Russian speakers outnumber their Ukrainian-speaking countrymen. Do they not have the right to secede from the country if they wish?

Borders are merely lines on a map. A split would allow a portion of Ukraine to rejoin Russia if it wished, while the balance of the nation would be far better off embracing Western Europe.

RON CHURCHILL
Vancouver

Scotland and the pound

SIR – I don’t see why unionists think they have won the debate over not letting an independent Scotland keep the pound (“Alex Salmond’s big problem”, February 22nd). Without an official currency-union Scotland could still use sterling. Ecuador adopted the American dollar as its legal tender in 2000 and many other countries employ the currency of a larger or more credible neighbour without explicit consent. In contrast to peripheral countries in the euro zone, these countries know they are unlikely to receive a bail-out should the need arise. As a result, they are less prone to engage in the sort of reckless fiscal behaviour that necessitates a bail-out.

Meanwhile, the country of issue collects seigniorage on its notes circulating abroad. If an independent Scotland were to employ the pound on the same terms, it would be good for Scots and Brits alike.

WILLIAM LUTHER
Assistant professor of economics
Kenyon College
Gambier, Ohio

SIR – You referred to the French Compagnie Universelle du Canal Interocéanique de Panama as the “first catastrophic failure” to build the Panama Canal (“Dead locks”, February 8th). But before that there was another colossal failure to use the Panamanian isthmus as a locus of trade.

The ill-fated Darien scheme in the late 1690s sought to create a Scottish colony in Panama to break England’s trade dominance in Africa and the Indies. The company was unsuccessful because of poor management and it almost bankrupted Scotland, accelerating its political union with England.

BENJAMIN TENNENBAUM
Chicago

SIR – I enjoyed reading about Orkney’s archaeology in “Dem bones” (February 22nd). As an orthopaedic surgeon, however, I found it most interesting that you thought the Vikings had a “tibula” instead of the tibia and fibula that are found in modern humans. Could their skeletal differences have played a role in making them superior warriors?

JOHN REYNOLDS
Knoxville, Tennessee

Managing the oceans

SIR – The ocean is indeed the victim of a big market failure (“The tragedy of the high seas”, February 22nd). But signs of hope lie in several examples that internalise ocean externalities through the reform of ocean management. First, the Pacific islands and distant-water fishing nations, responsible for 40% of the global tuna harvest, have put in place a state-of-the-art, science-based fishery compliance, monitoring and enforcement mechanism that is paid for largely by the fishers.

Second, through the International Maritime Organisation, the international community has agreed on a common framework for ballast-water management, creating a ballast-water treatment industry valued at \$35 billion. And third, 17 countries came together

in the Danube-Black Sea basin and invested billions in wastewater treatment and improved agricultural practices that helped to virtually eliminate the massive dead zone that had plagued the Black Sea.

Utilising these analyses and others as proxies, our 2013 report, *Catalysing Ocean Finance*, estimates that the costs of scaling up these and other approaches to address ocean threats at a global level are a very affordable \$5 billion over the next 10-20 years.

ANDREW HUDSON
Principal technical adviser on international waters
UN Development Programme,
Global Environment Facility
New York

Unresponsive AAP

SIR – Banyan’s column on India’s Aam Aadmi Party (AAP) exaggerated its prospects (February 22nd). It is questionable whether the AAP can form a coherent set of policies, as most of its issues are based on pure populism. For example, the party has not clarified its stand on Khap panchayats, or small-scale village assemblies. It recognises their social role, even though it acknowledges that they are unconstitutional.

What Banyan terms as a rejection of both “pre-1989 leftism” and “market fundamentalism” is actually just the vacillating position of the party’s leadership, rather than any consistent commitment to an economic policy (it opposes more foreign investment in retail). It is also questionable whether the AAP is gaining support among poorer voters. It has no presence among the rural poor and has lost the support of a section of the car-drivers’ union in Delhi, which was a source of strength during the Assembly elections. Banyan also attributes a new form of politics independent of caste and race to the AAP. That may be the view from metropolitan Delhi, but it doesn’t look that way from outside.

SHANTANU PRATAP SINGH
Lucknow, India

We built this city

SIR – Schumpeter’s column on the backlash against big tech in San Francisco described the protests as “nonsense” (February 22nd). Many residents whose families have lived in the city for generations are being evicted from their homes because rents are rocketing in response to the influx of tech workers. I know of one gay man who had lived in his apartment for 35 years but couldn’t afford the near doubling of his rent, which he had always paid on time. He owned a small bakery selling cakes made with natural green ingredients, though he has now had to move out of town. There are hundreds of similar stories about the eclectic, hard-working middle- and lower-income families that have made this city what it is and such a desirable destination for the new wave of yuppie workers.

Would you have us just pull up our roots and leave, as if we were itinerant workers? We do have a right to live in this city, even if, as you put it, we “can’t rub two pennies together”.

TONY CHUNG
San Francisco

Silvio: The Movie

SIR – You were right to note that “The Lego Movie” is something of an ideological Rorschach test for audiences (“The politics of little bricks”, February 22nd). However, given its portrayal of the harmful effects of a head of government owning his country’s largest media conglomerate, perhaps one could conclude that Silvio Berlusconi was a rich source of inspiration for the producers.

There are no Lego *bunga bunga* parties, but it is a children’s movie after all.

ALEX KOPECKY
Chicago ■

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- Execute and lead the newly approved strategy and transformation
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- Strengthen LIA's core capabilities, including corporate governance and LIA's reach in Libya and abroad
- Build-up the human resources and skills-base of LIA
- Manage the organization on day to day basis

The Person

- Libyan national
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- Knowledge of Libya's political and institutional landscape and ability to manage in the Libyan environment
- Educated to at least university level; preferably post graduate qualification
- Written and spoken fluency in Arabic and English

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- Managing all LIA's cash; place available funds and manage LIA's foreign exchange positions
- Maximize return on LIA's short-term assets, liaising with local and international banks
- Manage LIA's new Budget Stabilization Fund
- Manage LIA's FX and hedging positions

The Person

- 10-15 years of senior experience in cash management and/or Treasury, preferably within financial services with a bachelor's degree in Finance or Accounting
- Fluency in English and Arabic

Please send applications to Ms. Dana Barada:
dana.barada@metin-mitchell.com

SENIOR ADVISOR FOR FINANCE & CONTROL

Role

- Advise LIA in Tripoli and London and its subsidiaries to improve capabilities and skills
- Supervise the accounts of LIA and its subsidiaries and their accounting systems
- Work closely with the CEO's office to supervise the planning and budgeting process of LIA and its subsidiaries
- Assist in developing and maintaining financial reporting and MIS in line with the requirements of LIA and its subsidiaries
- Work with IT and the finance teams of LIA and its subsidiaries to select and implement IT infrastructure to support financial monitoring and reporting

The Person

- 10-15 years' experience at a senior level in Accounting or Finance, preferably within asset management or financial services in the MENA region
- Fluency in English and Arabic

Please send applications to Mr. Konstantinos Balasis:
konstantinos.balasis@metin-mitchell.com

HEAD OF HUMAN RESOURCES

Role

- Implement HR strategy and planning; oversee and advise on LIA's and subsidiaries' organizational structure and positions
- Manage the end-to-end recruitment process
- Lead organization's shift to a performance culture - identify knowledge and skill gaps and propose, implement development program to address these

The Person

- 10-15 years of experience at a senior level in human resources, preferably within financial services in the Middle East
- Fluency in English and Arabic

Please send applications to Ms. Farah Abdul Rehman:
farah.abdulrehman@metin-mitchell.com

HEAD OF COMMUNICATIONS & PR

Role

- Implement communications (both external and internal) and public relations strategy
- Develop/manage communication campaigns to assist LIA during its period of transition
- Manage communications with other Sovereign Wealth Funds and maintain relationships with the Central Bank and the Ministry of Finance.
- Assist the CEO in assessing, monitoring and managing LIA's brand image especially with the generic public

The Person

- 5-10 years of senior experience in Communications Management, PR and Public Affairs of financial institutions, preferably in the MENA region
- Fluency in English and Arabic

Please send applications to Ms. Farah Abdul Rehman:
farah.abdulrehman@metin-mitchell.com

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Assistant Administrator and Director Regional Bureau for Latin America and the Caribbean



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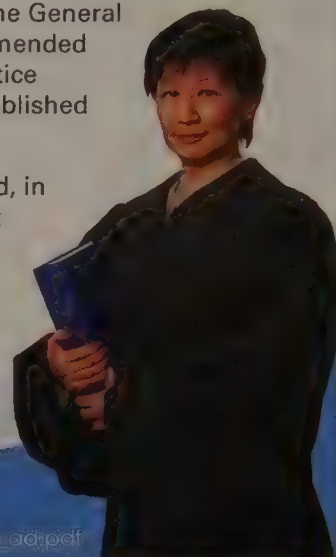
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The end of the beginning?

DONETSK, MOSCOW, SEBASTOPOL AND SIMFEROPOL

Having occupied Crimea, Russia is stirring up trouble in eastern Ukraine

UKRAINIAN fascists, nationalists and anti-Semites, sponsored by America, seize power in Kiev, overthrowing the legitimate (if ineffectual) president, Viktor Yanukovich. These new overlords humiliate Russian-speakers by outlawing the language and stand poised to sack Russia's naval base in Sebastopol. Ethnic Russians run to Vladimir Putin for protection; he duly comes to their rescue. Mysterious military men with Russian rifles save the peace-loving people from the fascist threat.

So runs the plot invented by Russian propagandists to plunge Ukraine into chaos and seize the Crimean peninsula. Surreal as it sounds, the plot has been given some substance: parts of it only in the rantings of Russian politicians and journalists, parts—notably the bit about the rifles—in boots-on-the-ground reality. This spectacle of deception has jeopardised European security and pushed Russia into a confrontation with the West unlike any seen since the cold war.

On February 27th, four days after the end of the Sochi Olympics, Russia in effect occupied Crimea, part of the sovereign territory of Ukraine, under the pretence of protecting its Russian-speaking popula-

tion. Russian forces based at various installations on the peninsula seized airports, government buildings and broadcasters within hours, and blockaded Ukrainian military bases. In Sebastopol, home to Russia's Black Sea fleet, local people celebrated their liberation in the central square, waving Russian flags to the accompaniment of Cossack songs, a Soviet-era pop group, and the fleet's choir.

There was only one thing missing: the enemy. Everyone in Crimea, and now across eastern Ukraine, is talking about Ukrainian fascists, but nobody has actually seen one. "We have not seen them here yet, but we have seen them on television," said Stanislav Nagorny, an aide to the leader of a local "self-defence" force in Sebastopol. The confusion was understandable: Russian television had unleashed a propaganda campaign impressive in both its intensity and cynicism, stoking ethnic hatred and exacerbating historical divides, mixing half truths with outright lies. Right-wing extremists and nationalists did take part in the revolution, but they do not control the government.

Russia struck when Ukraine was at its weakest—mourning the deaths of those

who died on the Maidan, Kiev's Independence Square, during an abortive crackdown by Mr Yanukovich, and struggling to form a new government. The Kremlin was greatly assisted in its task by Ukraine's parliament which, despite the obvious tension between the Russian-speaking east of the country and the Ukrainian-speaking west, irresponsibly passed a bill (later dropped) that repealed the status of Russian as an official language on a par with Ukrainian. Parliament also failed to bring politicians from eastern Ukraine into the government.

Into the soft underbelly

The choreography was at once smooth and farcical. Assisted by Mr Yanukovich's sudden reappearance on February 27th, Russia described events in Kiev as a coup while mounting a coup of its own to the south. As gunmen looked on, local deputies installed Sergei Aksenov, nicknamed "Goblin" and a rumoured ex-gangster, as prime minister (a perfectly legitimate procedure, according to Mr Putin). Mr Aksenov promptly called an unconstitutional referendum on Crimea's status, declared himself in charge of Crimea's armed forces and called on Mr Putin ►►

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for help. Days later Crimea's parliament voted to join Russia.

On March 1st Mr Putin asked the upper house of Russia's parliament to grant him the right to use military force in Ukraine. It dutifully did so, in a lurid and theatrical session that evoked the days of Soviet grandstanding and grand pretence. Senators competed to evoke to the greatest effect the horrors being visited upon Russians in Ukraine. Thus, under the guise of fighting fascism, Russia achieved a bloodless takeover that could not help but remind the West of the Nazi annexation of Austria and the Sudetenland in 1938-39.

Still, not everything has gone quite to plan. Ukrainian troops in Crimea were put under enormous psychological pressure to defect, their officers blackmailed with threats of retribution to their families if they did not surrender. Thugs surrounded the Ukrainian naval headquarters, cutting off its water and electricity. But if Russia was hoping to follow the scenario of the Georgian war in 2008, when it managed to provoke the Georgians to fire first, it flopped. Ukrainian forces remained calm, the vast majority refusing to budge. As a Russian speaker who serves in the Ukrainian fleet put it ironically, "Russians do not surrender." Dogged, as yet non-violent resistance seems to have given them a new sense of purpose and unity. Yet the tension could still result in violence. If it were to do so the Tatars, the indigenous Turkic people of Crimea, would fight on the side of the Ukrainian army.

The clash of civilisations

On March 4th, in his first public comments since the crisis broke, Mr Putin ludicrously denied that the troops on the ground were Russian forces. The very fact that he spoke lessened the tension, but what he said was not encouraging. Asked about the possibility of a wider war in Ukraine, Mr Putin sounded indifferent: it didn't seem necessary, he said, but if he chose to invade eastern Ukraine, the move would be entirely legitimate. And as for the Budapest memorandum of 1994, under which Russia, America and Britain guaranteed Ukraine's integrity in exchange for the country giving up its nuclear arsenal, Mr Putin no longer felt bound by it. Ukraine's revolution, he claimed, has produced a new state with which Russia has no binding agreements. Later on the same day, Russia tested a ballistic missile.

With the economy in the dumps, his personal popularity declining and discontent rising, Mr Putin needs to mobilise the country and tighten his control over its elites. Entering the 15th year of his reign, he lacks a narrative to carry him through until 2018 and beyond. A war with Ukraine could provide a boost if it led to the de facto annexation of Crimea, which in the Russian imagination is a storied, cherished ter-



ritory, the place where Vladimir I adopted Christianity as the state religion of ancient Rus, and a part of Russia until 1954.

It might equally backfire. If Mr Putin's confrontation with the West results in isolation and real economic pain, it could further alienate the elites and the public at large—rather as the war in Afghanistan did. On March 3rd Moscow's MICEX index fell by 11% (rebounding a fair bit the next day). The central bank spent \$11.3 billion of its ample reserves defending the rouble; even so capital flight is likely to surge.

After talking to Mr Putin Angela Merkel, Germany's chancellor, reportedly described him as "in another world." It is a place where Mr Putin appears to see himself not as an aggressor, but as a defender of all Russians (including Russian-speaking parts of Ukraine). He is an historic figure who is reversing the course of history that brought the Soviet Union to its knees, a hero standing up to the alien West.

When Mr Putin came to power in 2000, he was guided by the post-Soviet idea that Russia was converging with the West, albeit slowly and on its own terms. Membership of clubs such as the G8 mattered to him. This no longer seems to be the case. He appears to be driven by the idea that Russia is fundamentally different and morally superior. The fact that the Russia elite, dominated by former KGB men, is corrupt and cynical only strengthens the need for such an ideology: extraordinary corruption requires extraordinary justification.

Maria Snegovaya, a scholar at Columbia University, argues that Mr Putin's thinking is influenced by the writings of Ivan Ilyin, an émigré Russian philosopher of the first half of the 20th century, whose grave he has visited and whose works he often cites. "We know that Western nations don't understand and don't tolerate Russia's identity... They are going to divide the united Russian 'broom' into twigs to break these twigs one by one," Ilyin wrote.

A book of his essays, along with the works of like-minded philosophers, was given by the Kremlin as Christmas reading to its apparatchiks. Another favourite is "Third Empire: The Russia that Ought to Be", a Utopian fantasy set in 2054 that features a ruler named Vladimir II, who integrates eastern Ukraine into a new Russian Union.

In this world view, Ukraine's revolutionary bid to escape to the West is a betrayal of Slavic brotherhood. Russia's attempts to destabilise and split Ukraine are driven by a desire to "save" what it still considers to be part of the Russian world from Western annexation. This is the Kremlin's way of punishing a traitor, demonstrating strength to the West and to its own population and preventing the emergence of an alternative civilisation on its territory.

Eastern promises

Mr Putin may not wish, or be able, formally to annex Crimea, and he says that Russia has no plans to do so. More likely he intends to use it a destabilising factor and leverage for splitting Ukraine further. The ultimate goal may be turning it into a federation where tight Russian control of the eastern parts stops the country as a whole from moving towards the West.

Repeating the Crimean scenario in the east of the country would be harder. One reason is the reluctance of local elites, including the oligarchs, police chiefs and criminal bosses, to cede their territory to their Russian counterparts. The interim government in Kiev has already appointed powerful tycoons to run the vulnerable areas in eastern and central Ukraine.

Russia is already sending tremors through the industrial east. In Donetsk, the Ukrainian and Russian flags have alternated atop the local administrative offices. The pro-Russian crowds are warmed up by agents provocateurs and supported by "volunteers" from across the Russian border. Russian social networks have been used to ►►

► recruit volunteers to go to Kharkiv, Donetsk and Odessa for “moral support” and to participate in anti-Ukrainian rallies. “We need men aged 18-45 who are already in Ukraine, or are ready to go,” says a page called Civil Defence of Ukraine. “Don’t take anything...with you. Remember you are just a tourist”.

There are also strong rumours of the involvement of the Russian security services and forces loyal to Mr Yanukovich. On March 3rd a 1,000-strong crowd of pro-Russian separatists in Donetsk stormed the building of the local administration and nominated as governor Pavel Gubarev, a marginal politician who was previously unknown in Donetsk. Mr Gubarev is an activist of the Eurasian Youth Movement, a Russian nationalist outfit set up after the Orange revolution of 2004 to counter the spread of Western ideas. Two days later Mr Gubarev was pushed out and the Kiev-appointed governor, the oligarch Sergei Tar-

uta, walked in.

On March 5th Mr Gubarev’s mob gathered again, 2,000 strong, some of them aggressive looking young men, many of them older. They shouted “Russia, Russia” as second-world-war anthems called on the Soviet country to rise against fascists. They retook the building only to be removed again the following day.

Their “enemies” gathered a few hundred metres away by the church of St Michael the Archangel: largely Russian-speaking, mostly young and cosmopolitan. Yulia Kubanova, a 28-year-old who works in advertising, held a banner saying “Ukraine is United”. “I never asked whether I was ethnically Ukrainian or Russian,” she said. “I am a Ukrainian...I am proud of my country where people know what dignity is.” Ms Kubanova had been to lay flowers by for those who died in Kiev. A middle-aged woman attacked her: “She called me a Nazi and a whore.” ■

happened, Europe seems more focused on pre-emptive diplomacy. The two approaches could, if co-ordinated, be complementary. They could equally lead to division, recrimination and a failure to achieve either goal.

Mr Obama has a freer hand than many European leaders when it comes to imposing costs and consequences on the aggressor. The relatively tiny amount of trade that America does with Russia—about \$40 billion a year compared with a figure ten times that between Europe and Russia—means that America has little to fear from Russian retaliation to any sanctions. But that also cuts the other way: without Europe on board, American sanctions on Russia will hardly set Moscow quivering. Nor would a confrontation be free of other sorts of cost. Russia could close a valuable supply route into Afghanistan that keeps American troops fed and watered. On the diplomatic front, it is in Mr Putin’s power to make the West’s life harder still over Syria and Iran.

The American president has a further freedom—that which comes from the indifference of the American public, fewer than one in five of whom think that it is America’s duty to protect Ukraine or sort out the crisis. Moreover, though Mr Obama has faced rhetorical blasts from Republicans eager to blame him for Mr Putin’s aggression (see Lexington), behind closed doors Washington is unusually united, thanks to Mr Putin’s bullying.

Congress is approving \$1 billion in loan guarantees for Ukraine. Various bilateral meetings to boost trade with Russia have been suspended, as have the Pentagon’s military-to-military contacts with Russia. Preparations for the June G8 summit in Sochi have been put on hold amid calls across the political spectrum for Russia’s G8 membership to be suspended for a year or more.

There is debate about how forcefully to ►►

The international reaction

Sixes and sevens

BRUSSELS AND WASHINGTON, DC

Europe and America are outraged by the annexation of Crimea, but lack a strong response

VLADIMIR PUTIN was never going to let the Ukrainian revolution go unanswered. All the same, the speed with which he moved to seize Crimea came as something of a shock. The immediate Western response was to find some way, through threats, diplomacy or a mixture of the two, to stop the Russians going farther into eastern Ukraine. When Russia’s military exercises close to the border ended without incident on March 4th there was a sense of something like relief in the capitals of Europe, a feeling—quite possibly a complacent one—that things were, at least, not getting worse.

On March 5th José Manuel Barroso, president of the European Commission, announced a package of economic aid for Ukraine (see next story) in advance of an emergency European Union (EU) summit set for March 6th. On the same day, in Paris, John Kerry, America’s secretary of state, met his Russian counterpart, Sergei Lavrov. The Americans and the Europeans want to persuade Moscow to open a dialogue with the new government in Kiev and also to withdraw its forces in Crimea to their bases and allow in international monitors. While Russia has not recognised the new regime in Kiev, talks that were expected to begin in Rome as *The Economist* went to press could lead to the establishment of a “contact group” that might include the EU, the United Nations, the Organisation for

Security and Co-operation in Europe (OSCE) and both Russia and Ukraine.

While this may represent some progress, there is a difference in approach between the EU and America that could frustrate the tough diplomacy that is called for. They agree that the Russian move into Crimea was illegal, that subsequent moves into eastern Ukraine would be a disaster, and that Western military action would be folly. But while America is clear in its desire to punish Mr Putin for what has already



Lavrov and Kerry: Can you believe this guy?

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► pursue visa bans against Russian officials deemed responsible for human-rights abuses in Ukraine. Republican hawks have sounded keener than Mr Obama's aides on sanctions against members of Mr Putin's inner circle, business leaders and selected financial institutions, with the House Foreign Affairs Committee chairman, Edward Royce, calling for "crippling sanctions on Russian high-ranking officials, state-owned banks and commercial enterprises, and key individuals behind the Russian intervention."

Some senators have also called for America to reinstate plans to install missile-defence systems in Poland and the Czech Republic. Russia disliked those plans, which were dropped in 2009, a move Mr Obama's critics saw as evidence of weakness. Officials and ex-officials are not keen, though. Kurt Volker, a former American ambassador to NATO, notes that the system was always designed to deal with rogue missiles from Iran, though Russia purported not to believe this. To revive the scheme in order to punish Mr Putin would make it look as though it had been a plot against Russian interests all along.

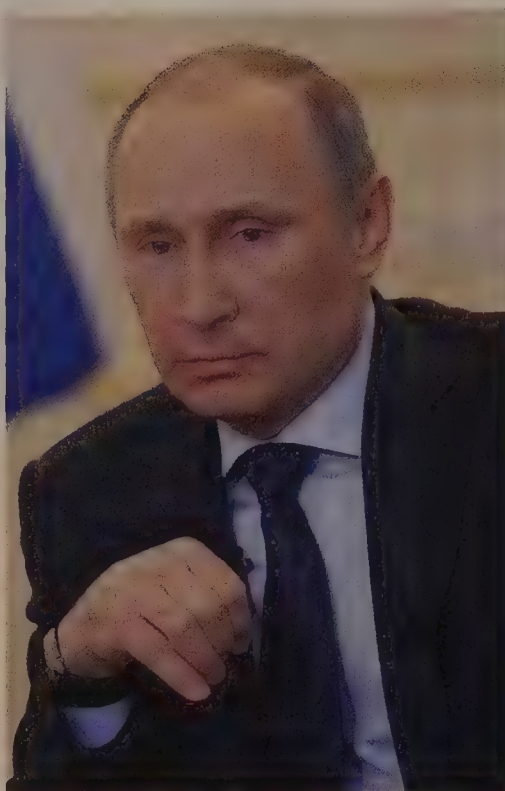
Some in Europe would be happy to take the sort of line America is developing. Led by Poland, the "new", former communist, members of the EU from central Europe would like to spell out sanctions that Russia will face if it does not vacate Crimea, and to threaten an oil embargo if it pushes into eastern Ukraine. If nothing else, argue the Poles, an explicit threat would strengthen Europe's negotiating hand.

Telephone diplomacy

The doves, led by Germany, take the opposite view. Angela Merkel, the German chancellor, has been much tougher with Mr Putin than her embarrassingly Russophile predecessor, Gerhard Schröder, but for now she has set her face against sanctions. According to her spokesman, Steffen Seibert, she is "entirely focused" on securing a "peaceful resolution of the crisis". A telephone call between the chancellor and Mr Putin on March 2nd started discussions about the possible contact group. As one diplomat puts it: "Now is the time to lock the Russians into diplomacy. You have to make it hard for the Russians to say no. Sanctions will only drive Russia back into the bunker."

Mrs Merkel's approach may owe quite a lot to the importance of her country's trade relationship with Russia—about a third of the gas and oil Germany imported last year came from Russia, while around \$48 billion worth of German vehicles, machine tools and chemicals went in the other direction. But that is not the whole story (see *Charlemagne*)—and she has plenty of support elsewhere in the EU.

Britain, for example, has shown no great enthusiasm for sanctions that would



Not a worried man

damage the rich pickings the City of London makes from handling Russian money. Hugh Powell, the deputy national security adviser, was photographed going into 10 Downing Street on March 3rd carrying a document stating that the "UK should not support, for now, trade sanctions...or close London's financial centre to Russians." Another Brussels diplomat sums up the conundrum thus: "The Russians need us economically more than we need them. But their ability to take economic pain is greater than the EU's."

How far apart does this leave the Europeans and Americans? To some extent the differences are more rhetorical than real. Sanctions that would really hurt Russia, such as locking Russian banks and financial institutions out of the American-dominated international financial settlement system—the sort of measures that have caused Iran real pain—are likely to be held in reserve as a deterrent against further action. Most of the other sanctions being discussed are of limited effectiveness.

Limited visa bans would be an irritant in Moscow, but are unlikely to apply to those who really matter because the West needs to go on talking to them. The same applies to freezing the financial assets of Kremlin officials and supportive oligarchs. Some of those assets have already been moved to territories where they are less vulnerable. Slowing down trade talks that run on for years is not much of a threat.

Suspending Russia from the G8 would hurt Mr Putin a bit—he enjoys the opportunity to grandstand on a world stage—but he would still have the BRICS summits to look forward to. Brazil and India have been typically silent on Russia's Ukraine adventure. China, while saying it respects "the in-

dependence, sovereignty and territorial integrity of Ukraine", has avoided explicit criticism of Russia, just as it did when Georgia was invaded in 2008. Like his predecessors, President Xi Jinping regards China's relations with Russia as a useful counterweight to American power.

With both American and European officials emphasising the need to "de-escalate" the crisis, progress on any sort of sanctions will probably be stately. The priority for now is to reach some agreement with Russia over such things as a timetable for elections and a framework for moves towards devolved power in parts of the country.

Jonathan Eyal of RUSI, a London think-tank, argues that the West's inability immediately to deprive Mr Putin of his victory should be set against the substantial cost he is likely to end up paying in the end. In the first place, while stirring up discontent in parts of Ukraine that he may not be able to control, he has almost certainly turned much of the country against Russia in a way that it was not before. Future leaders of Ukraine will face even greater popular pressure to turn West.

Secondly, Russia's aggression has breathed new life into NATO, which has been searching for a post-Afghanistan role. Poland, Romania and, most of all, the three Baltic states feel genuinely threatened. Poland, Lithuania and Latvia have invoked Article 4 of the treaty, a rarely used rule allowing any ally to consult with the others if it feels its security, territorial integrity or independence are under threat. Were it not for the more famous Article 5 that commits all members to regard an armed attack on one as an attack against all, Lithuania, Latvia and Estonia all believe that they would be next in line for Moscow's revanchism. The next NATO summit, to be held in Wales in September, will have a sense of real urgency. Mr Putin may end up with one of the things he has wanted least—a NATO with a new sense of purpose.

Out of gas

Mr Putin has also virtually ensured that Europe will accelerate the steps it is taking to reduce its dependence on Russian energy. Europe's gas supply has become more resilient and diversified in the past decade. Liquefied natural gas (LNG) is ever more available for import, and today's interconnector pipelines already allow LNG unloaded in Britain to be sent more or less anywhere in continental Europe. Estonia, Latvia and Lithuania are still wholly dependent on Russian gas, as are Hungary, Bulgaria and Moldova—but the Baltics are scrambling to install LNG terminals.

Parts of Europe are likely to accelerate the exploitation of shale-gas reserves; for its part, hydrocarbon-rich America can now be expected to move quickly to end legal restrictions on exporting oil and LNG. Having lost its reputation for reliability as a



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▶ gas supplier through frequent sanctions and threats, Russia must live with the consequences. As its stockmarkets demonstrated on Monday, it also needs to be aware that its economy is now vulnerable to investor sentiment, a much quicker comeback than sanctions.

In seizing Crimea and cocking a snook at the West, Mr Putin believes he has got away with an act of daring that will cement his popularity at home as a brutally effective statesman. He is right that the short-term consequences he faces for his recklessness may prove relatively trivial. But the long-term cost for a country that needs investment, trading partners and markets could still be high. Mr Putin may not suffer prompt retaliation. That does not mean, in the long run, that Russia does not face serious consequences. ■

The economic battleground

Gas and chocolate

Supporting Ukraine's economy will not be easy or cheap

THE Ukrainian economy is a mess. Its currency, the hryvnia, has lost almost 20% of its value in the past month. Foreign-exchange reserves have tumbled to \$15 billion, despite the imposition of capital controls (see chart 1). Bank deposits fell by more than 3% in the first half of February and, since the revolution, the government has imposed limits on further withdrawals. Tax revenues have collapsed and pension payments have been delayed.

The country was in poor-enough economic shape before all this: it was one of the reasons why Viktor Yanukovich, the deposed president, chose \$15 billion in Russian loans over a deal with the European Union—the decision that led to his downfall. Having propped up the Ukrainian economy, Russia seems to have the power, as energy provider, trading partner and

creditor, to cripple it.

The most obvious economic attack would be to cut off the Ukraine's gas. That need not have huge effects either on western customers whose gas comes via Ukraine or on Russian gas earnings. Other Russian pipelines could handle much of the gas. But it would still be a costly tactic, and one to which the Ukrainians are not as vulnerable as they might seem. They have large gas-storage facilities conveniently situated in the west of the country. How much gas the stores contain is unclear, and its ownership is murky—but after a mild winter there is probably a buffer of several months. Moreover, Ukraine should be able to import gas from Slovakia, reversing the flow of a main east-west pipeline. It has twice done this on smaller pipelines during previous disputes with Russia.

Trade is also a weapon which imposes costs on the aggressor, but an easier one to wield with precision. A quarter of Ukraine's exports head east and Vladimir Putin is not shy about messing with them; Russian restrictions, like those placed on Ukrainian chocolate last year, could cost the country billions, with the losses targeted on particular sectors, even particular oligarchs. This week Russia banned pork from Ukraine, saying political instability had undermined safety inspections. Though Mr Putin says he wants to strengthen trade, instability is unlikely to be in short supply over the coming months.

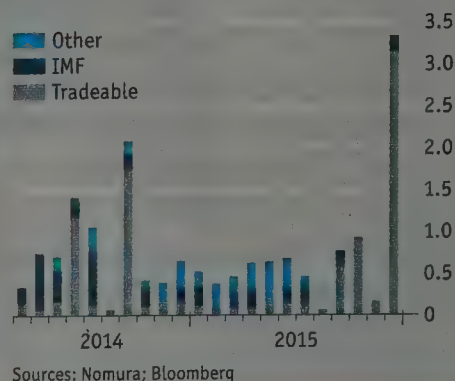
As a creditor, Russia has given itself room for mischievous manoeuvre. The way its bail-out to Mr Yanukovich, \$3 billion of which was delivered before the revolution, was structured gives Mr Putin leverage that could scupper any attempts to reach agreements with other creditors in advance of forthcoming payments (see chart 2). And some fine print stipulates that if Ukraine's debt-to-GDP ratio exceeds 60% it would automatically be in default.

Russia's legal poison pills could make dealing with Ukraine's debts harder at a time when they are sure to grow; without loans from the West the government will run out of money. If Ukraine had sensible economic policies such loans would be easily made, since the country's current debt burden, at 47% of GDP, is not excessive. But Ukraine has almost never had sensible policies; it has profligate ones, and the investors who used to support that profligacy when Ukraine offered high interest rates and a stable currency are now nowhere to be seen.

Time for the IMF, which has ample experience with this kind of balance-of-payments crisis. The standard remedy includes tough reforms—in Ukraine's case, a large depreciation (much of which has already happened), slashed energy subsidies and big budget cuts—in return for funds to tide the country over until it can once again borrow from private markets.

Coming due

Ukraine debt servicing schedule, \$bn



Sources: Nomura; Bloomberg

Ukraine probably needs \$3 billion to \$4 billion in budgetary finance to last until after the May election. A larger loan of \$15 billion would allow it to meet its external financial obligations for the next year.

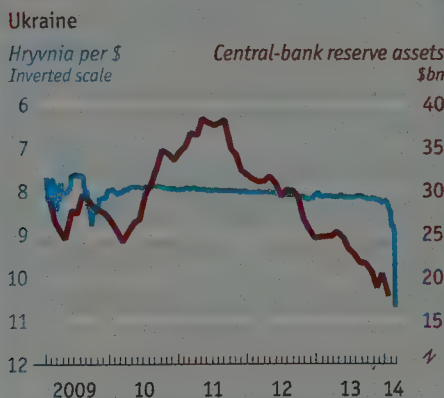
America is keen for the IMF to negotiate a big package of loans and reforms as soon as possible, arguing that Ukraine's transitional government not only needs the support, but also can make progress where others have failed. Alexander Turchinov, the interim president, has already said he would accept all the IMF's terms, including draconian spending cuts.

But many of the IMF's technocrats, and its member countries, dislike the idea of America using the fund as a geopolitical tool—worries given a bitter edge by the fact that America's Congress recently refused to approve an expansion of the fund's coffers. They would prefer that the IMF chip in \$1 billion, with few strings attached, under its Rapid Financing Instrument. Other short-term help is available. On March 5th the EU offered €1.6 billion in short-term macroeconomic assistance, as well as a lot of development aid in the longer term. (It also wants to re-open the trade discussions scuppered by Mr Yanukovich.) Add in the \$1 billion loan guarantee announced by John Kerry this week and Ukraine can probably stumble along until May, at which point a newly elected government could negotiate a long-term package.

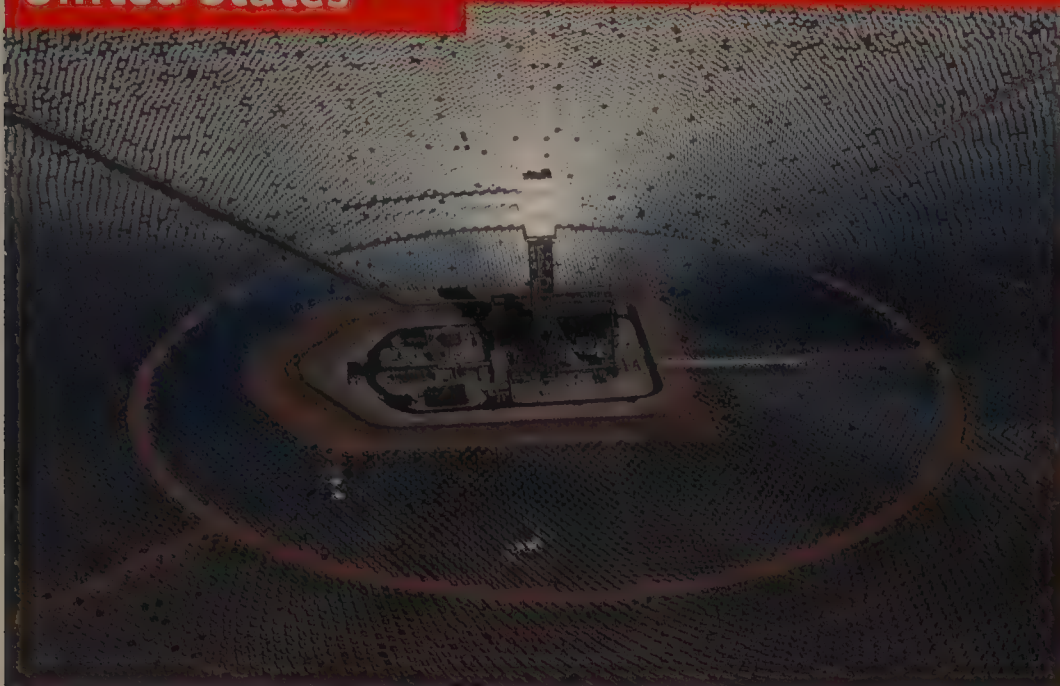
The politics of the rescue may get harder when it becomes clear where some of the money will end up. Using Western taxpayer's money to pay off Mr Putin or the hedge funds that bought high-yielding Ukrainian debt is an ugly prospect. So Ukraine may try to renegotiate terms with its bondholders, which would be where Mr Putin's leverage could come into play.

But it would also be where a reform plan with solid Western support would yield dividends. If Ukraine's economy is being transformed and the IMF is satisfied, Russian bloody-mindedness need not slow the country's return to the market, even if it forces a form of default. But if Ukraine's reform commitment wobbles, Russia has room to cause yet more trouble. ■

Downfall



Sources: Thomson Reuters; National Bank of Ukraine



Clean energy

Let the sun shine

IVANPAH VALLEY, CALIFORNIA, AND LEXINGTON, NORTH CAROLINA

The future is bright for solar power, even as subsidies are withdrawn

FORTY-FIVE minutes west of Las Vegas, dejected sinners may encounter a sight to lift their sunken hearts: a sea of 347,000 mirrors, reflecting the rays of the desert sun on to boilers mounted on three 460-foot towers. The Ivanpah solar-thermal plant (pictured), which opened in mid-February, is the largest of its kind in the world. Fully ramped up, it will deliver around 377 megawatts (MW) of power to 140,000 homes in southern California. Its backers compare it to the nearby Hoover Dam; an astronaut claims to have spotted it from the international space station. It is a striking sight, even if the heat from its heliostats has roasted dozens of unfortunate birds alive.

Solar power in America is growing rapidly, albeit from a small base (see chart). Last year it represented 29% of new electricity capacity, behind only natural gas at 46%. Solar output has more than doubled during Barack Obama's time in office; GTM, a research firm, reckons it will grow another 26% in 2014. The Department of Energy wants solar to provide 27% of America's electricity by 2050, up from less than 1% today.

Though dazzling, Ivanpah and large plants like it will not generate much of this growth. The federal loan guarantees that allowed their creation have expired. More important are photovoltaic solar cells, a rival technology that converts sunlight directly to electricity. Their cost has fallen so quickly that in many places retail electricity customers are saving money by placing panels on top of their houses or business-

es; 200,000 have done so in the past two years. And there is a lot of room to grow. "There's no market saturation in any state; not even close," says Lyndon Rive of SolarCity, a solar-installation firm. Even David Crane, the boss of NRG, co-owner of Ivanpah, says that photovoltaic installations are the future.

Last year sun-soaked California accounted for over half of America's new photovoltaic installations. That, say solar fans, shows that the sector can thrive even after it loses its subsidies. (The \$2.2 billion California Solar Initiative, which gave cash to homes or firms that went solar, has largely expired.) Solar is also blossoming in unexpected places like Massachusetts and North Carolina.

A bigger test will come in 2017, when the federal government's solar-investment tax

Also in this section

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credit drops from 30% to 10% (unless Mr Obama can convince Congress otherwise). Still, says Shayle Kann at GTM, this will be no "death knell"; it will simply eliminate some marginal projects. And by then there may be a revival of Ivanpah-style solar-thermal plants, as energy-storage technologies improve and utility firms look to them to provide steady power throughout the day.

Yet even if solar power is a boon to consumers, it threatens some utilities. Energy has traditionally been generated centrally, distributed over power lines and sold to consumers. Distributed solar power—generated from rooftop panels—undermines that model. The Edison Electric Institute (EEI), a trade group, warns that distributed generation could do to energy companies what the internet did to newspapers.

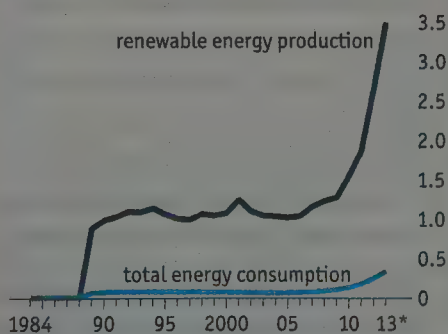
Bet your bottom dollar

Regulations are adapting to this shift: all but seven states have adopted net-metering policies, which credit solar-enabled homes and businesses for the excess energy they feed back into the grid. At least 22 states allow consumers to buy the electricity produced by solar panels that a third party installs on their homes. This lets people take advantage of solar's savings without having to pay the hefty up-front installation costs. In 2013, third-party-owned systems accounted for most solar installations in California, Arizona, Colorado and Massachusetts.

Some utilities grumble that customers who benefit from net metering escape the costs of maintaining the grid they depend on. Last year Arizona Public Service, the state's biggest electric firm, urged regulators to slash the savings that new solar customers would derive from net metering. After a fierce campaign their call was rejected, though the regulator approved a small solar surcharge. Georgia Power also proposed a fat tariff; it too was defeated.

The sun'll come out tomorrow

Solar energy as % of:



Source: Energy Information Administration

*January–November

Julia Hamm of the Solar Electric Power Association identifies three ways regulators could help utilities cope with these changes. First, they could demand monthly infrastructure fees from solar users. Second, they could list every component of value separately rather than wrapping the cost of infrastructure maintenance, for instance, into usage charges. Third, they could split energy used and consumed into separate transactions, meaning that a solar customer sells all his energy to a utility before buying what he needs.

Yet those last two proposals leave unanswered the question of what rate utilities should pay customers for their power—or more broadly, what the price of solar, with all externalities factored in, ought to be. And more battles loom; California's regulator must make an important decision on net metering this month. Further ahead the growth of distributed solar will pose other threats to the utilities' traditional business model. "Net metering is just the pointy edge of the wedge," says Adam Browning

of Vote Solar, an advocacy group.

Still, while user-generated solar power makes utilities skittish, many have rushed to embrace it on the supply side. In 2013 they installed roughly 4,100MW of solar capacity, up from 2,390MW in 2012. Renewable portfolio standards, which in 30 states force utilities to generate a certain share of their electricity from clean sources, are part of the reason. But so is hard economics: low installation and labour costs, clean power delivery at peak midday hours and a hedge against fuel-price volatility.

Many of these gains have already been banked. Photovoltaic modules have become slightly dearer lately; costs will rise further if the Commerce Department heeds protectionist calls by some domestic manufacturers and expands tariffs on imports from China and Taiwan. Yet solar firms are not short of ideas to cut costs elsewhere: third-party financing, for example, or securitising pools of solar leases to reduce financing costs. For makers and users of solar power, the future looks bright. ■

The president's budget

Sliding away

NEW YORK

Barack Obama's failure to control entitlement spending puts his good ideas at risk

WHEN he became president in 2009, Barack Obama's job was pure fire-fighting. His huge package of bail-outs and stimulus was justified by the awful symptoms of the slump: a jobless rate approaching 10% and a deficit of \$1.4 trillion. It worked: the economy was growing again by late 2009; the deficit soon tumbled. Yet many Americans grumble that Mr Obama

has been an economic disappointment. His latest budget, presented on March 4th, will do little to change that view.

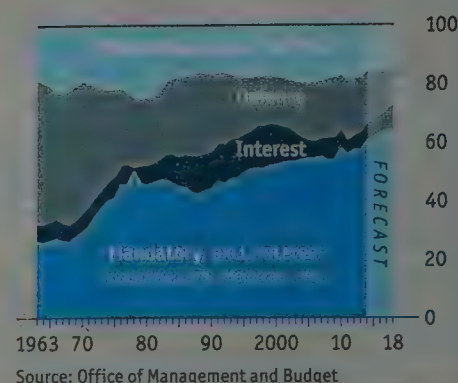
America's political cycle doesn't help. A bipartisan budget deal was signed only in late December, and Washington is already squarely focused on congressional elections in November. Mr Obama's sixth budget is a statement of his priorities rather than a guide to what might actually happen, says William Gale of the Brookings Institution, a think-tank. Even so, it is full of ideas to add zip to the flagging recovery.

To tackle poverty and joblessness, Mr Obama would expand the Earned Income Tax Credit (EITC), a subsidy for low-paid workers. Because it boosts pay (by up to \$1,000 a year) without raising firms' hiring costs, it should encourage work and hiring. It is costly: the tax credit bill is already \$78 billion a year. But more and better jobs will cut other bills, like the \$80 billion America spent on food stamps in 2013.

Tilting taxes to boost growth is one of the president's main ideas. His blueprint would make breaks for innovative firms permanent and more generous: the "Research and Experimentation" tax credit would rise from 14% to 17%. He would also fund more basic research—the cutting-edge stuff that lab-based boffins do. Both these steps please economists: more new ideas

Who pays as America greys?

Federal budget spending, % of total



should boost productivity and wages.

Bound by the December spending deal, each of Mr Obama's payouts is twinned with a revenue-raiser. Tax credits for the poor would be funded by closing loopholes used by the rich. American firms, if the president had his way, would be prevented from shifting profits overseas to avoid the taxman. Another priority, preschool for all four-year-olds, would cost \$75 billion over ten years. That cash would come from a long-promised rise in cigarette taxes. Still, despite a progressive tax code and all Mr Obama's talk of promoting equality, America still redistributes less than most other rich countries. Both Britain and Luxembourg—hardly hellish places for bankers—shift more income from rich to poor (see chart 1).

Mr Obama wants to boost spending on things that enhance growth in the long term, such as science and roads and schools. This "discretionary" category accounted for just 15% of spending in 2013. It could be squeezed painfully if any of the "mandatory" parts of the budget—such as transfers to the old and debt payments—unexpectedly grow. That is not something to bet against (see chart 2). The health entitlements that old and poor Americans receive—Medicare and Medicaid—have shot up in recent years, rising from 11% of outlays in 1990 to 21% by 2007. Since then their growth has slowed; Mr Obama's plans, which would raise more revenue from

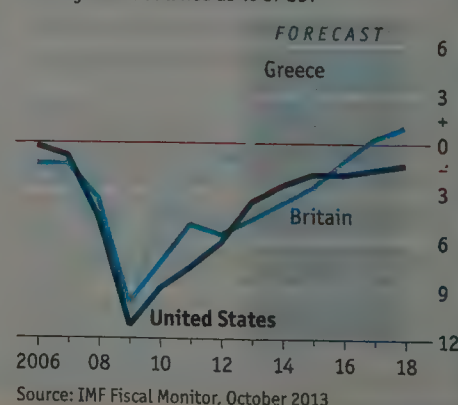
Obama's America isn't Europe

Inequality reduction owing to fiscal transfers
Points on Gini scale of 0–100, 2010 or latest available



Make me virtuous, but not yet

Primary fiscal balance as % of GDP



drug firms and through higher fees for patients, aim to keep public outlays under control. But that has always been hard.

Social Security, which pays pensions and disability benefits, is just as worrying. It paid out \$808 billion in 2013—more than Medicare and Medicaid combined—and will grow as America ages. Interest payments, already equal to four-fifths of Medicaid outlays, are expected to soar from \$221 billion in 2013 to \$827 billion in 2023. According to Mr Obama's forecasts these rises will not be a problem, since robust growth will create a primary surplus by 2018. But, given America's performance to date, that seems optimistic (see chart 3).

Mr Obama's presidency may turn out to be a lost opportunity, says Maya MacGuineas of the Committee for a Responsible Federal Budget, a think-tank. As the leader of the party seen as more protective of entitlement programmes, he could have led a bipartisan reform of them. Instead, his budget promises the opposite, scrapping a new inflation-index that would have slowed the growth of outlays. If both parties could work together on phased cuts, reform would be much less painful, says Ms MacGuineas; if they do not, future cuts to social budgets may have to be much sharper. Mr Obama may face a double failure: watching his pro-growth policies slide out of reach, and leaving his successor with an entitlements black hole. ■



cal campaigns. The new rules are tighter: "political" activity would include any public statement that mentions a candidate near an election, and even private communications if they advocate voting for or against a candidate. The American Civil Liberties Union, another 501(c)(4), thinks this would have the effect of "chilling a vast amount of core political speech about crucial issues of the day".

Social-welfare groups first appeared in the tax code in 1913, but their role in campaigns has only attracted attention since the Supreme Court's *Citizens United* decision in 2010, which removed some restrictions on political spending by companies and unions. The special appeal of 501(c)(4)s is that they do not have to disclose who their donors are. In 2008 \$70m was spent on fighting elections by groups that did not disclose their donors. In the 2012 election cycle that quadrupled to \$311m. This trajectory has continued: the amount spent by groups with anonymous donors in the current election cycle is three times greater than at the same point in 2012, says the Centre for Responsive Politics, which tracks campaign spending.

In theory these organisations are restricted to spending less than half of their money on campaigning. In practice there are various ways round this rule. Some spend up to their allocation on attack ads and then pass the rest on to another similar group, which does the same, and so on until there is nothing left unspent.

A recent case in California, where campaign-finance laws force more disclosure than in federal elections, illustrates how hard it can be to follow the money as it bounces from group to group. In the hope of swaying a couple of ballot initiatives, 150 donors in California gave \$29m to a group called Americans for Job Security, which is based in Virginia. It then transferred most of that money to a group in Arizona called

the Centre to Protect Patient Rights, which transferred some to a group in Iowa called the American Future Fund and some to another group in Arizona called Americans for Responsible Leadership. Only then did the money find its way back to California.

Most money spent by such groups helps Republican candidates, which perhaps explains why Democratic politicians have denounced the practice so fiercely. Their outrage may have encouraged staff at the IRS to single out Tea-Party groups for intrusive scrutiny, a practice that became public last year and has been mentioned daily on conservative talk radio ever since. The current consultation was an attempt to undo this damage, but it has had the opposite effect, and may end the attempt to change the rules altogether.

This may be a good outcome. The agency that collects taxes must be politically neutral—and seen to be so. That is impossible if it is also in the business of defining what people can and cannot say during elections. But one real problem needs to be addressed. The *Citizens United* decision is mostly noted for releasing a torrent of campaign spending by outside groups. Yet it also said that disclosure and transparency were needed to enable voters "to make informed decisions and give proper weight to different speakers and messages". That is not possible when nobody knows who is doing the speaking. ■

The IRS and political speech

Levi and the 501s

WASHINGTON, DC

Asking tax collectors to regulate election spending is a terrible idea

IF GOVERNMENTS ask for feedback on new policies it is usually a prelude to doing what they had in mind anyway. Not so with the Internal Revenue Service (IRS)'s consultation on tax rules for social-welfare organisations, which are more interesting than they sound. By the time it closed on February 27th, the exercise had attracted more than 68,000 comments. Some suggested that the IRS was the tool of a dictatorship bent on destroying America's democracy. Others were less polite.

At issue was the taxman's attempt to define what social-welfare organisations (known as "501(c)(4)s" after the line in the tax code that covers them) may do without losing their tax-exempt status. Thousands of organisations that play a big part in public life, from the National Rifle Association to the local green pressure group, fall into this category.

IRS rules already limit the extent to which 501(c)(4)s can get involved in politi-

Capital punishment

Death for the mentally disabled

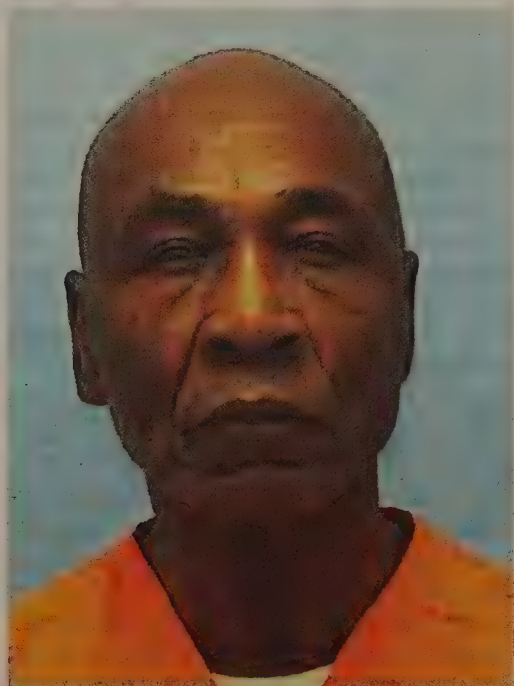
WASHINGTON, DC

Can you execute a man whose IQ is 71?

WHEN Bill Clinton was governor of Arkansas, he oversaw the execution of Ricky Ray Rector, a man so mentally disabled that he said he would save the pecan pie from his last meal "for later". In 2002 the Supreme Court ruled that putting mentally retarded people to death was "cruel and unusual", and therefore unconstitutional. But the justices left it up to the states to define what "retarded" meant, and this has proved so difficult that on March 3rd the issue came before the court again.

A Florida man named Freddie Lee Hall (pictured on next page) was convicted in 1978, along with an accomplice, for the rape and murder of a pregnant woman and the murder of a police officer. He was sentenced to death. His lawyers are appealing that he is mentally incapacitated.

For the bulk of the hour-long hearing, the justices quizzed Seth Waxman, representing Mr Hall, and Allen Winsor, Florida's solicitor-general, about the role of sta- ▶▶



Too bright to live

► tistics in defining intellectual disability. Florida requires defendants to demonstrate both “significantly subaverage intellectual functioning” and impairments in “adaptive behaviour”, such as communicating and looking after oneself. Psychiatrists use a similar approach and, like Florida, consider an IQ score of 70 or below indicative of mental disability. But unlike many states and against the medical consensus, Florida uses 70 as a rigid cut-off point. Mr Hall’s IQ in 2002 was 71, so Florida deems him eligible to die. It refuses to consider other evidence of his disability.

That is a very slim line between prison and death, but, as Justice Sonia Sotomayor said, “A line has to be drawn somewhere.” The main question she and other justices pressed is whether Florida may ignore the “standard error of measurement” in intelligence tests. “It is universally accepted”, Mr Waxman argued, that people with “scores of 71 to 75 can and often do have mental retardation” because of a five-point margin of error. The four liberal justices, along with the swing voter, Anthony Kennedy, were inclined to agree. “Your rule prevents us from getting a better understanding of whether that IQ score is accurate or not,” Mr Kennedy admonished Mr Winsor.

Justice Stephen Breyer noted, with obvious disapproval, that Mr Hall “has been on death row for over 35 years”. Justice Kennedy asked Mr Winsor if he considered Florida’s brand of delayed justice to be “consistent with the purposes of the death penalty”. This inquiry from Mr Kennedy had nothing to do with the narrow legal question of the day, but it betrayed his more general doubts about the way the Sunshine State puts people to death.

Antonin Scalia, a conservative justice, was more hostile to Mr Hall’s defence. He noted that it took ten years after his initial conviction for Mr Hall’s lawyers to raise

the issue of retardation. He added that the complexity of the crime—which involved hiding one victim’s body in a wood—belies Mr Hall’s purported disability. The state might well argue, Justice Scalia said, that Mr Hall “could not have pulled all of this off” if he was really so intellectually impaired. This is an old theme for Mr Scalia, who argued back in 2002 that the court’s bar on executing the mentally disabled would turn “the process of capital trial into a game” where murderers “feign mental retardation” to avoid the death penalty.

Justice Elena Kagan cut to the chase late in the proceedings: “Can I just ask,” she said to Mr Winsor, “why you have this policy?” Initially flummoxed, Mr Winsor replied: “Florida has an interest in ensuring that the people who evade execution because of mental retardation are people who are, in fact, mentally retarded.” Raising the IQ cutoff to 75 to take account of the margin of error, he said, “would double the number of people who are eligible for the...exemption.” In other words, Florida wants to execute more people, and therefore uses the most rigid definition of retardation that it can get away with. It might not get away with it for much longer. ■

Abortion

The 20-week limit

DURHAM, NORTH CAROLINA

New curbs on abortion are spreading

MOST Americans are ambivalent about abortion. According to Gallup, 61% believe it should be legal during the first three months of pregnancy, but this figure drops to 27% for the second trimester and 14% for the third. Pro-lifers know they cannot ban abortion outright—the Supreme Court ruled in *Roe v Wade* in 1973 that the procedure is legal until the fetus is viable, that is until it can survive outside the womb. But lawmakers in several states are hoping to ban abortions after 20 weeks.

Bills in Mississippi, South Carolina and West Virginia have been hurtling through state legislatures and are likely to become law. These bans, which do not include exceptions for rape or incest, would join 13 others in Republican states, mostly in the South and Midwest. Another 20-week ban ►►

Ohio’s law against untruth

Is it wise to criminalise lies?

ATLANTA

Challenging the Buckeye State’s ban on political mudslinging

POLITICIANS never lie. So you should not be allowed to lie about them. That seems to be the logic behind an Ohio election law that makes it a crime, punishable by six months in prison and a \$5,000 fine, to disseminate a falsehood about a candidate if it is “designed to promote” his election or defeat. Mudslingers are outraged. A brief filed to the Supreme Court on February 28th by P.J. O’Rourke, a satirist, and the Cato Institute, a think-tank, says the law “blatantly violates the First Amendment.”

The case, which will be heard on April 22nd, was brought by the Susan B. Anthony List (SBA), an anti-abortion group, against the Ohio Elections Commission and Steve Driehaus, a former congressman from Ohio. In 2010 Mr Driehaus, a Democrat, voted for Obamacare. During the next election campaign, SBA planned to erect billboards in his district reading: “Shame on Steve Driehaus! Driehaus voted FOR taxpayer-funded abortion!”

Mr Driehaus believes that accusation to be false: although Obamacare subsidises the purchase of health insurance that may cover abortions, it forbids insurers from paying for abortions with federal funds. SBA scoffs that this is an accounting gimmick. Before the billboards went

up, Mr Driehaus filed a complaint with the Ohio Elections Commission. The complaint was eventually dropped, but the law’s chilling effect remains. The billboards never went up, and another group that wanted to oppose Mr Driehaus was scared off.

Mr O’Rourke argues that “disparaging statements about one’s opponent (whether true, mostly true, mostly not true, or entirely fantastic) are cornerstones of American democracy.” After all, he asks, “where would we be without the knowledge that Democrats are pinko-communist flag-burners...who will steal all the guns and invite the UN to take over America”, while “Republicans [are] assault-weapon-wielding maniacs who believe that George Washington and Jesus Christ incorporated the nation.”

More seriously, government is ill-suited to judge when a statement crosses the line into falsehood. (“Two Pinocchios out of five is OK, but three is illegal?” asks Mr O’Rourke, alluding to a scoring system used by the *Washington Post*’s Fact Checker—which sometimes disagrees with other media fact-checkers.) Forbidding “lies” will not produce political discourse filled with accuracy and brilliance; it will produce silence.

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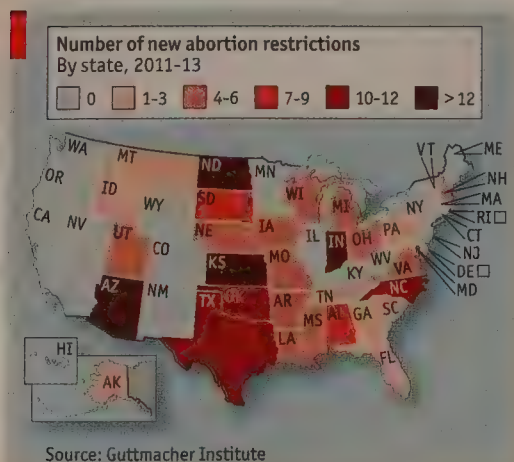
will soon be introduced in Florida. (In Washington, DC, House Republicans passed the "Pain-Capable Unborn Child Protection Act" last summer, but it has no chance of becoming law.)

The 20-week bans are "a place of consensus", says Marjorie Dannenfelser, president of the Susan B. Anthony List, a pro-life group. Hardly. Pro-choicers say they are unconstitutional, since a 20-week-old fetus is not viable. Pro-lifers either point to advances in medicine that allow some fetuses younger than 24 weeks to survive or contend that *Roe v Wade* was wrongly decided and should be overturned. Some also claim that 20-week fetuses can feel pain, though neuroscientists and the American Congress of Obstetricians and Gynecologists say this is impossible.

In the court of public opinion, however, 20-week bans raise relatively few hackles. They affect just over 1% of abortions—though the circumstances of these abortions are often dire, as most fetal abnormalities are only detectable at 20 weeks, according to Planned Parenthood, a group that provides contraception and abortions.

Since 2010, when Republicans gained control of most state legislatures, curbs on abortion have proliferated. Between 2011 and 2013 states enacted 205 of them (see map)—more than in the previous decade, according to the Guttmacher Institute, a pro-choice think-tank. Some of these rules make it extremely hard for abortion clinics to operate: at least five have closed in Pennsylvania and two in Virginia.

The 20-week bans are politically potent. They offer social conservatives something to get fired up about, which may make them more likely to vote. They also put some Democrats in a tough spot, particularly if they are running for statewide office in a Republican state. Wendy Davis, a politician who made herself famous by filibustering an anti-abortion bill in Texas (which passed anyway), recently suggested, while campaigning for governor, that she would have backed the state's 20-week ban if it had included exceptions for the health of the mother or fetus. She described it as the "least objectionable" part of the bill.



Pro-lifers hope the 20-week bans will end up in the Supreme Court and give it a chance to scrap *Roe v Wade*. Such an outcome is highly unlikely, unless some of the court's liberals retire and are replaced by a future Republican president. The justices recently rejected the chance to review Arizona's ban, which had been struck down on appeal. But more curbs may force the court to revisit the issue; litigation is expected to cost states millions of dollars.

All this comes at a time when abortions are actually in decline. Between 2008 and 2011 their number fell by 13%, from 1.2m to under 1.1m, says the Guttmacher Institute. This obviously cannot be explained by the restrictions that were introduced after 2011. A more likely reason is that women had fewer unwanted pregnancies, in part owing to better access to contraception. ■

Florida's snowbirds

A chilly welcome

GULFPORT, FLORIDA

Congress protects America from Canadian pensioners

ACHORE combining carpentry with diplomacy awaits Gordon Bennett, a retired Canadian soldier, after his move to a larger mobile home near Florida's Gulf coast. As commander of an overseas post of the Royal Canadian Legion, he likes to fly his national flag from a handy palm tree. But as a respectful guest—one of about half a million Canadian "snowbirds" who own winter homes in Florida, using special visas good for a total of 180 days in any 12-month period—he knows to follow strict protocol when mounting his flags, or face complaints from American neighbours. His Canadian flag cannot be flown on its own but must be paired with the Stars and Stripes (though never on the same pole). The American flag may not be smaller or fly lower, and must be flown in the position of honour (the right, as you emerge from a doorway).

Mr Bennett, a genial octogenarian, does not resent the fussing. In his winter home of Pinellas County—an unflashy region of mobile home parks, "senior living" complexes, golf courses and strip malls—the welcome is mostly warm for Canadian snowbirds, who pump billions of dollars into Florida's economy each year. His post shares premises with the American Legion, and has introduced local veterans to Moose Milk, a lethal Canuck eggnog-variant involving maple syrup. He routinely brings 50 or 60 Canadians to ex-service-men's parades, picnics or dinner-dances.

But once issues of sovereignty are raised, America's welcome can chill. Visa

rules force Canadian pensioners to count each day after they cross the border, typically in late October. They are enforced ferociously: overstayers may be barred from re-entry for five years. Some members of Congress have been trying to ease the rules for Canadian pensioners since the late 1990s. A law allowing Canadians over 55 to spend up to eight months in America each year, as long as they can show leases for property down south and do not work, passed the Senate in 2013 as part of a comprehensive immigration bill, but like the bigger bill, it has now stalled. In the House of Representatives an extension for Canadian snowbirds has been tucked into the JOLT Act, a tourism-promotion law introduced by Joe Heck, a Nevada Republican.

Canadian pensioners are not an obviously threatening group—few Americans report being mugged by elderly Ottawans armed with ice-hockey sticks. They pay property and sales taxes in America. They must cover their own health-care costs while down south, through the Canadian public health-care system and private top-up policies. If allowed to stay for eight months, most would stay only seven, predicts Dann Oliver, president of the Canadian Club of the Gulf Coast (staying longer would complicate their health cover and their tax status). They just want a few more weeks in the sun.

Yet even something this easy is proving hard. Mr Heck is willing to tweak his bill to focus on two reforms: the Canadian extension and visa interviews by video-conference for Chinese, Brazilian and Indian would-be visitors, who currently face long journeys to American consulates. But many members of the House "are reluctant to do anything with the word immigration in it," says Mr Heck. Optimists hope the bill might come up for a vote this year. For Mr Bennett and his wife, Evelyn, Canadians whose "bones ache" in their homeland's cold, it can't come too soon. ■



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Lexington | The Ukraine blame-game

Critics say that Barack Obama dismays allies and emboldens foes. They're half-right



TO SOME critics, Ukraine's agonies are Barack Obama's fault. His lead-from-behind foreign policy has so dismayed America's allies and emboldened its foes that Russia knew it could send troops prowling round Crimea with impunity.

The crisis is the "ultimate result of a feckless foreign policy where nobody believes in America's strength any more," says Senator John McCain of Arizona, the dean of the Republican Party's (much-diminished) national-security wing. To another hawk, Senator Lindsey Graham of South Carolina, a "weak and indecisive" Mr Obama "invites" aggression. Even some Democrats have broken ranks. One, Senator Chris Coons of Delaware, has blamed trouble in Ukraine, in part, on Mr Obama's "perceived weakness" in Syria, which has left not just Russia but "vital allies" doubting America's will to act.

Some frustration is sincere. Mr Obama's professorial, chin-stroking approach to geopolitics can grate at the best of times—pondering his own foreign policy in a recent interview with Bloomberg View, he called it "restrained, and I think thoughtful". These are not the best of times. In particular, even friendly governments call Mr Obama's Syria policy a mess, notably since he failed to enforce his vow that the use of chemical weapons would be a "red line" triggering military strikes, instead grabbing at a Russian offer to help dismantle Syrian stocks of poison gas.

Yet there is a self-serving undercurrent to much "Who Lost Ukraine?" commentary. It is not just that Republicans enjoy painting Mr Obama as a new Jimmy Carter. Those pondering a White House run in 2016, such as Senator Ted Cruz of Texas, see a chance to attack Hillary Clinton, Mr Obama's former secretary of state and a putative Democratic presidential contender, for her role in an ill-fated "reset" of relations with Russia.

The sheer range of the charges being levelled against Mr Obama is unhelpful. Rigour demands that they be weighed one by one. First take the charge that Mr Obama's "weakness" emboldens President Vladimir Putin of Russia. True, Mr Obama is sceptical about the use of large-scale military force to resolve geopolitical tangles (though he uses drones and special forces liberally). But none of his critics has called for American troops or warplanes to rush to Ukraine's aid. "There's no viable military action that can be taken, I accept that," sighs Mr McCain.

Perhaps critics mean that Mr Putin might have stayed his hand if he had harboured just a doubt about Mr Obama's willingness to use force. But Mr Putin invaded another neighbour, Georgia, in 2008, when America's president was George W. Bush, whose martial zeal few doubted. Mr Bush airlifted Georgian troops home from Iraq and sent American military transport planes to Georgia's capital, Tbilisi, to make it harder to overrun. His vice-president, Dick Cheney, vowed that "Russian aggression must not go unanswered." But it did go unanswered, largely. Russia took effective control of a fifth of Georgia after a peace deal brokered by European leaders. Russians control that territory to this day.

Now Washington is alive with politicians suggesting fierce policies that might cow Mr Putin this time round. Many, such as visa bans and asset freezes for Russian oligarchs, have little support in Europe. Others are not in America's power: Mr Cruz talks of suspending Russia from the UN Security Council. Some are unwise. Several senators want Georgia and Ukraine on a fast-track to NATO membership, though neither is ready (and many European allies would not defend them against Russia, undermining the main article of that alliance).

Those convinced that a weak Mr Obama has emboldened foes are concentrating on the wrong bit of his foreign policy. Managing a thug like Mr Putin, who would distrust any American president, was never going to be easy. More thoughtful critiques consider how Mr Obama relates to allies.

Mr Putin is not deterred by even the toughest Western rhetoric when he sees a chance to advance national interests, says Fiona Hill of the Brookings Institution, a think-tank, who led government intelligence analysis of Russia during the Georgian crisis. The only way now to slow his march into Ukraine, she suggests, is for America to work in lockstep with Europe, preventing Mr Putin from exploiting Western divisions.

Kurt Volker, a former American ambassador to NATO, wishes that America had worked with Europe years ago to make Ukraine's oligarch-infested energy sector more transparent. Senator Bob Corker of Tennessee, the senior Republican on the Senate Foreign Relations Committee, wants co-ordination with Europe on economic aid for Ukraine. Senator Marco Rubio, a Florida Republican, argues for opening up American gas exports to the region, to weaken Russia's grip as an energy supplier.

While Putin puts the boot in, the West is disputing

Alas, Team Obama is surprisingly bad at alliances. In Ukraine, America largely outsourced policy to Europe for many months, before deciding too late that it was going wrong. Forget criticism in Washington about how a stronger, Reaganesque president might intimidate foes. A larger problem is the White House's resentful attitude towards America's friends. Officials grumble about being stuck with the job of keeping the peace in Asia, Europe and the Middle East while free-riding allies enjoy the fruits of global trade. Time for others to step up and do their share of maintaining an open international order, they say. Officials talk of the "bandwidth" chewed up by high-maintenance bits of the world, when Mr Obama would prefer to focus on fast-growing Asia, or—as public opinion loudly demands—on nation-building back home.

Well, tough. Great powers cannot always choose where to expend time and energy. Mr Obama did not cause Russia's assault on Ukraine: that has roots which long predate him. But now he must lead efforts to contain Mr Putin's mischief. ■

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iPhononomics

One phone, many countries

Costly Brazil, dysfunctional Argentina, bureaucratic Mexico.
Our correspondents go shopping for the same Apple product

APPLE products are designed to say something about their owners. They also tell you something about the countries in which they are sold. Latin America's allure as a consumer market was underlined on February 15th, when the technology firm opened its first retail store on the continent, in Rio de Janeiro. Apple wants a bigger slice of the region's smartphone market, which has been growing faster than any region outside Asia (see chart). But the glass screen of the iPhone 5s, Apple's flagship smartphone, also reflects Latin America's economic diversity.

Start with Brazil, the region's biggest consumer market. Despite sluggish economic growth, Apple chose to plant its flag there for a reason. The country is among the top five markets for smartphones in the world. Last year was the first when more smartphones were sold in Brazil than traditional mobile phones, according to Abinee, an electronics-industry association; it was also the year when tablet sales overtook those of desktop computers. As many as 1,700 people queued up to be among the first on Apple's Rio premises.

iPhones are beyond the reach of most people in all the countries of Latin America, but the sticker shock is particularly striking in Brazil. A 16GB iPhone 5s costs 2,519 reais (\$1,076), compared with an average monthly income of just under 2,000 reais in the main metropolitan regions. That makes Brazil the dearest, in dollar terms, of the countries where Apple has stores; the tax-inclusive price of a 16GB iPhone 5s in the United States is around \$700.

The fault lies with the infamous *custo Brasil* (Brazil cost), the exorbitant cost of doing business in the country. The high price

of the iPhone 5s is largely due to tariffs and state and federal taxes on imports, says Luis Fernández of Deloitte. He calculates that a gizmo which a foreign supplier sells for 1,000 reais could end up being resold at 2,017 reais, with taxes amounting to 900 reais, or 45%, of that sum. Brazil's government has introduced tax incentives for companies ready to assemble gadgets in the country. But even then, the *custo Brasil* hits home: iPads and older iPhones assembled locally still cost more than they do in the United States, thanks to high labour costs and expensive commercial rents.

iWatering

At least wannabe iPhone users in Brazil can get their hands on the things. In Venezuela the shortages that have hit everything from basic groceries to catfood had caught up with the gadget market well before the unrest that started in February.

Since 2010 telecoms service providers in Venezuela have been barred from purchasing direct from manufacturers and must go through a government intermediary, Telecom Venezuela. But Telecom is no longer authorising purchases by the providers, and their shelves are bare of phones. In the run-up to the December local elections, President Nicolás Maduro also forced retailers, especially of electronic goods, to slash their prices. Samsung-branded shops in Caracas look as if they have been looted.

A Venezuelan determined to get his hands on a 5s has a couple of options: either bring one in personally or buy one via MercadoLibre, Latin America's equivalent to eBay. But only a tiny minority of Venezuelans can afford the phone in any case. Because of the huge gap between the official and unofficial exchange rates, goods that are imported at the black-market rate are out of reach to most. It would take the average earner nigh on two years to have enough to buy an iPhone.

Venezuela is a law unto itself, but neither is Argentina any place to buy the 5s. In 2009 President Cristina Fernández de Kirchner passed a law that was designed to promote industry in Tierra del Fuego, the southernmost tip of the country and a splendidly daft place to locate a high-tech cluster. Devices that are assembled in the Patagonian province benefit from a 60% re-



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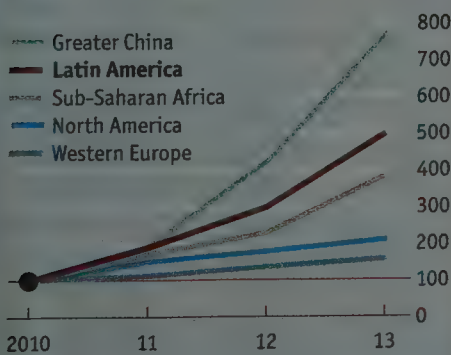
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Upwardly mobile

Smartphones, unit sales, 2010=100



duction in excise taxes. Samsung and BlackBerry did decide to start producing in Tierra del Fuego as a result: their devices are widely available, bearing orange stickers to advertise the fact they are "made in Argentina". Apple refused to play ball, and most stores do not stock iPhones.

The easiest place to buy the iPhone 5s is again on MercadoLibre. Another option is to have friends travelling to the United States or Europe act as iPhone mules, although that can mean sticky moments at customs: passengers are only supposed to bring goods worth \$300 into the country, and a 50% tax is payable on anything in excess of that. Using an iPhone can also lead to political embarrassment: Argentina's vice-president, Amado Boudou, once got into hot water for tweeting from his iPhone about the need to protect local industry. ►►

Argentina is a member of Mercosur, a trade bloc that often seems ambivalent about trade. In the countries of the Pacific Alliance—Chile, Colombia, Mexico and Peru—things are easier for aspiring Apple customers. Consumers in these places have few problems getting hold of the iPhone 5s, provided they have two things: money and time.

"There are plenty of iPhones in Mexico. What's lacking is purchasing power," says Ernesto Piedras, head of the Competitive Intelligence Unit, a research firm in that country. BlackBerry and Samsung have

24% of the smartphone market each, says Mr Piedras, compared with Apple's 14%. An iPhone 5s bought without a plan costs 10,599 pesos (\$800). That is beyond the reach of most Mexicans, as are Telcel's monthly plans (85% of mobile usage in the country is pay-as-you-go). So iPhone vendors tend to focus on selling not the 5s, but previous models that are more affordable. The black market is another option for cash-strapped consumers. Places like San Andresito, a sprawling marketplace in Bogotá, offer Colombians the chance to find iPhones at cheaper prices than usual.

Patience is the other requirement. Your correspondent in Mexico City recently acquired an iPhone 5s from Telcel, by far the biggest mobile carrier, for 4,000 pesos (\$300), as part of a two-year plan. The process took two hours and the plan is stingy. Obtaining a smartphone contract in Peru similarly involves lots of queuing, lots of paperwork, and the waste of a few hours. The hassles do not end there. Customer service is poor and flaunting your new toy risks theft. That is true of other countries in the region, too. Diverse as it is, Latin America does have some things in common. ■

Bello | A test of political maturity

Only outsiders can break Venezuela's deadlock

IN DECREETING that the Carnival holiday would last an extra two days this year, Venezuela's president, Nicolás Maduro, seemed to have hit on a clever way to damp down opposition protests that began four weeks ago. But the gambit failed. The protests have claimed 18 lives; scores have been injured and hundreds arrested. And still they rage.

As in 2002-04, when a similar protest wave threatened Hugo Chávez's populist regime, Venezuela is split into two irreconcilable camps. Back then, an unpopular Chávez withstood vast demonstrations, a short-lived coup and prolonged strikes-cum-lockouts. Mr Maduro seems to think he can likewise ride out the storm. His security forces continue to beat up demonstrators and his officials denounce the opposition as "fascists". His offers of dialogue smack of bad faith and the government shows no sign of entertaining the opposition's demands.

Contrary to the regime's claim, these do not include the overthrow of the government (though that would surely delight many). Instead the opposition is calling for the restoration of democratic norms—the release of its jailed leaders, the disarming of *chavista* paramilitaries, an investigation into the deaths and torture of demonstrators, media freedom and the replacement by bipartisan consensus of Supreme Court justices and members of the electoral tribunal whose terms expired last year.

Mr Maduro, narrowly elected after Chávez died a year ago this week, still has the support of many poorer Venezuelans. But the opposition senses that time is no longer on the government's side. Mr Maduro lacks both his mentor's political skills and also his good fortune. Chávez survived in 2002-04 largely because the oil price shot up, giving him a windfall that he spent on Cuban-designed social



programmes. In contrast, Mr Maduro must grapple with a rotten legacy: soaring inflation, widespread shortages and crime. The economy needs a devaluation and also for the private sector to function. But that is anathema to his base.

By taking to the streets, the opposition is laying bare the contradiction at the heart of *chavismo*. Though Chávez claimed to lead a revolution, his legitimacy came from the ballot box. If Mr Maduro steps up repression, the regime will become an outright dictatorship for the first time. But the opposition has a problem, too. The next election (for the legislature) is not due until 2015 and a recall referendum cannot be held before 2016. It fears that by then Venezuela will be a totalitarian state and its chance will have gone—so it will not give up today.

With the two sides locked in mutual mistrust, more Venezuelans are likely to pay the price with their lives. Breaking the deadlock needs the help of outsiders. But whom? The government refuses any role for the Organisation of American States (because it includes the United States); after Panama called for a debate there, Venezuela broke off ties with the Central American country on March 5th.

Neither the Union of South American Nations, whose secretary-general is a *chavista*, nor CELAC, a broader regional group currently chaired by Cuba, which provides Mr Maduro with political and security advice, is credible as a referee. By giving subsidised oil to a dozen Caribbean and Central American countries, Venezuela has bought their loyalty.

Back in 2003 Brazil organised a "Group of Friends" to mediate in Venezuela. Could it do so again? Brazil's left-wing presidents have sided with Venezuela's government out of a mixture of ideology and business opportunity.

Latin American leaders clothe their silence over *chavismo*'s gutting of democracy with the mantra of non-intervention, as Brazil's Dilma Rousseff did last month. But that policy is applied only when it suits them. Brazil intervened to punish both Honduras and Paraguay when left-wing presidents were ousted (constitutionally in Paraguay's case). Argentina's foreign minister complains that Venezuela's demonstrations risk overthrowing an elected government—yet that was how his own party came to power in 2001.

Brazilian officials say that they are working behind the scenes to persuade Mr Maduro to be more moderate. If so, they are not having much success. Fernando Henrique Cardoso, a former president and political opponent of Ms Rousseff, notes that Brazil would not be taken seriously as a world power if "we stayed paralysed in our area of direct influence".

On March 11th Mr Maduro will join other regional leaders for the inauguration of Chile's new president. It is a timely moment to launch a mediation effort to bring peace and restore democratic norms to Latin America's most troubled country. Venezuela's turmoil poses a test of the region's political maturity. Looking the other way is no answer.

Separatism in Quebec

Unspoken desire

MONTREAL

The Parti Québécois treads softly on the question of independence

SINCE its founding in 1968, the separatist Parti Québécois (PQ) has had a single goal—independence for the largely French-speaking province of Quebec. When it won majorities in 1976 and 1994, they were followed by provincial referendums on independence in 1980 and 1995. The first was lost by a wide margin, the second by a hair's breadth. Quebec secessionists have long expected to have a third go when the party next forms a majority government.

That moment looks close. On March 5th Pauline Marois (pictured), the PQ leader and head of a minority government in Quebec since September 2012, called a snap election for April 7th. Polls suggest the PQ will win a majority of seats. Yet Ms Marois has fobbed off attempts to pin her down on the timing of a referendum by announcing that a PQ majority government would first commission a white paper on Quebec's future. Such hesitancy has dismayed stalwart separatists keen to get on with creating a country out of Canada's second-most populous province. But Ms Marois has sound reasons to tread softly.

First, the party's recent surge in the polls has little to do with public support for separation, which has stayed at around 40% for the past 12 years. It has everything to do with the PQ's proposed law to ban public servants from wearing overt religious symbols such as a hijab, kippa, kirpan or a large crucifix (small ones are fine, apparently).

Critics see this as a naked attempt to polarise the electorate, pitting traditionalist Quebecers against new immigrants from Muslim countries in north Africa and drawing a line between multicultural

Montreal, a stronghold for the opposition Liberals, and the rest of Quebec. If so, it has worked a treat. "It works well with their base, which is francophone, rural and over 45," says Christian Bourque of Leger Marketing, a polling firm. It also distracts from the PQ's limp economic record and unmet promises from the 2012 election campaign.

There are strategic reasons not to promise a swift referendum, too. Talk of national unity tends to bolster the federalist Liberal party, which held 49 seats to the PQ's 54 in the outgoing provincial legislature. The Liberal campaign slogan—"Ensemble, on s'occupe des vraies affaires" ("Together, taking care of real business")—suggests the party will try to tap the concerns of business about separatism. Corporate Montreal has already suffered the effects of long-term uncertainty about Quebec: many firms moved head offices in the late 1970s, among them the Bank of Montreal, whose headquarters are now in Toronto. But few doubt there would be further damage if Quebec split.

François Vaillancourt of the University of Montreal estimates the loss of federal transfers, higher interest rates on Quebec's debt and trade disruption would knock 5-7% off provincial GDP following a split. And just as separatists in Scotland are grappling with questions about its currency and relationship with the EU, big questions remain about whether an independent Quebec should retain the Canadian dollar and be part of a currency union, and about its future within NAFTA.

All of which suggests the PQ will continue to steer away from the sovereignty question. How long it could avoid a referendum in office is less clear. "It would be hard for them not to hold one. How else do you keep your supporters mobilised?" asks André Lecours of the University of Ottawa. "But it's tricky because you don't want to lose a third one." Ms Marois called an election when she felt confident of winning; that may be what is needed for her to trigger another vote on independence. ■

Wage negotiations in Argentina

Class war

BUENOS AIRES

Teachers' unions go out on strike

"IT CAN'T be that every annual salary negotiation makes it a strain just to begin the school year," said President Cristina Fernández de Kirchner during a speech to Congress on March 1st. Yes it can.

Strikes this week delayed the start of classes in 19 of Argentina's 24 districts, after provincial unions and governments failed to reach agreements about wage rises. Negotiations between the national government and federal unions, which are meant to set a minimum benchmark for the provinces, also foundered. With some unions demanding more than 40% hikes, the national government and Buenos Aires's provincial government, the most influential negotiators, offered increases of just 22% and 25.5% this year respectively. The unions called the proposals "a provocation".

Tension had been expected. The teachers' unions want salary rises above Argentina's galloping inflation rate. Since the start of the year the government has devalued the Argentine peso by over 20%, causing inflation expectations to spike. According to Eduardo Levy Yeyati of Elypsis, a consultancy, prices are expected to jump by 32% this year. And now that the government has started publishing more realistic data, it cannot simply pretend the problem of rising prices does not exist.

The teachers' unions have a strong hand. In December provincial police squeezed 35-100% pay increases out of their employers. Public-sector employees are not fearful of losing their jobs. Strikes give unions the power to cause widespread chaos.

But the government cannot afford to concede too much ground. The negotiations with the teachers will set a precedent for salary talks with other unions scheduled for later this month and April. To ensure that inflation does not continue to accelerate, the authorities need to curb real wages. Budgetary considerations also play their part. According to Economía & Regiones, a research group, if the provinces were to grant 30% raises to their 2m employees, that would double their collective fiscal deficit.

That may nonetheless be what happens. In the five jurisdictions that were able to reach accords, the teachers and the provinces agreed to increases of around 30%. That wouldn't do much to bring down inflation, but it would at least help keep it from skyrocketing. And it would mean the school year can begin. ■



Encore une fois, Marois?



North Korea

Better tomorrow?

SEOUL

The world's vilest regime flirts with economic reform

CAN you be both the world's most brutal wielder of state terror and a fan of economic opening? Kim Jong Un, North Korea's ruler, appears to be having a go. Three months ago Mr Kim suddenly purged his immensely powerful uncle by marriage, Jang Sung Taek, and had him executed, supposedly for treason. Now the young dictator may have purged the other regent who oversaw the leadership succession after Mr Kim's father, Kim Jong Il, died in late 2011. Choe Ryong Hae, who had the rank of marshal (though a civilian), was reckoned to be the second-most powerful man in the country. He has not been seen in public since February 16th, and rumours are swirling about his fate.

With such ruthlessness, Mr Kim may have found his inner Stalin. Yet tantalising hints are also multiplying that the government is getting serious about economic reforms of the kind that were anathema to Kim Jong Il. Last year it was announced that over a dozen economic-development zones around the country would be established—the kind of zones, inviting foreign investment, which set China's economy alight in the late 1970s. Astonishingly, the government has also praised an experiment in family-based farming, seeming to hint at a loosening of the strictures of collectivised agriculture. A building boom is changing the skyline of Pyongyang, the capital. And a once-closed country is welcoming foreign visitors. In January a ski re-

sort, Masikryong, opened its doors. It was built in record time, and supposedly to international standards. The country's army, government institutions and decrepit enterprises are being urged to dive into their work with "Masikryong speed".

Much remains unclear, including the motivation for such changes (in North Korea at least, never use the R-word—reform). Could it even be that the regime wants to improve the lot of ordinary folk? North Korea's economic backwardness is surely a growing embarrassment to its administrators, increasingly aware of the outside world, through the North's trade with China and from growing knowledge about vibrant South Korea. Some are being versed, thanks to foreign assistance programmes, in modern administration and basic financial theory. Pressure for change within the system is growing, and competition for scarce foreign investment is intense.

Improving the common lot does not have to be entirely at odds with the regime's narrower and overriding motivation: to secure enough resources to keep the Pyongyang elites, who form a tiny fraction of the population, sweet with financial perks and luxury goods. Elite cohesion is central to the survival of a regime that has outlasted by decades predictions of its demise. In the past, such resources were secured through criminal rackets selling weapons, drugs and counterfeit money, as well as by shaking down the outside world

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using nuclear blackmail. Yet in recent years, the world has wised up, and foreign currency has slowed to a trickle. What little was available may have been exhausted on Mr Kim's childlike peccadillos, including a dolphinarium, water theme-park and equestrian club as well as the loss-making ski resort. It would be a brave person who challenged Mr Kim's pet projects. But the regime has fewer resources to spray about.

Mr Jang's execution may well be connected. Enterprises under Mr Jang were central to the state's moneymaking, and he may have been keeping back huge amounts for himself and cronies. Almost certainly that rankled with the Korean People's Army. In December Radio Free Asia claimed that an armed clash took place between soldiers and Mr Jang's agents over control of a profitable fishing spot off the west coast. That month soldiers involved in the fisheries were treated to an outing at Mr Kim's new water park. The dictator reassured the army that it must "continue to take the lead in fishing". In 2012 the North's fish and seafood exports to China totalled \$67m, ranking as its sixth-most valuable export item, according to KOTRA, South Korea's investment-promotion agency.

Trading rights are another coveted resource. Licences for excavating coal, gold, silver and iron ore are divvied up and doled out to the regime's most powerful organisations. Mr Jang's department managed a host of firms that held licences to trade with China. His biggest deals by far were in coal: Sungri Trading, run by two of Mr Jang's closest aides, handled 70% of all North Korea's lucrative anthracite exports to China, according to Cho Bong-hyun at the IBK Economic Research Institute, in Seoul, South Korea's capital. Both men were executed in November.

The military court that sentenced Mr Jang charged him with building a "little ►►

kingdom". Cheong Seong-chang of the Sejong Institute near Seoul says Mr Jang's business came to be seen as a "fourth economy" outside those run by the Korean Workers' Party, the army and the government. For Mr Kim to allow such wide-ranging privileges suggests how keen he was to use the currency Mr Jang raked in—until it was clear how much was being kept back.

The potential sums involved are large. In 2012 trade between China and North Korea topped \$6 billion, twice the level of three years earlier, according to KOTRA figures. Nine-tenths of exports of iron ore and coal go to China. The mines operate at under a third of their capacity, suffering from rundown machinery and patchy supplies of electricity. But delays and poor quality allow China to exact huge discounts, knowing how few countries the North can sell to, because of international sanctions.

Mr Kim is presumably desperate to be

less dependent on China, a country many North Koreans resent (the new economic zones have next to no Chinese involvement). It may help explain a mildly friendlier approach to the South, after ructions last year. Last month the regime allowed brief reunions to go ahead for families separated for decades. Senior officials from both sides met at the border for the first time in years. And South Korean business investment is encouraged in a railway and port at Rajin-Sonbong, close to Russia.

Ripping off foreigners remains a patriotic duty, and the changes do not yet amount to a real opening. Even if they did, it would be wrong to expect any diminution of repression in the world's cruellest state. North Korea, says Aidan Foster-Carter, an expert at Leeds University, reserves the right to pursue economic restructuring without political openness—*perestroika* without the *glasnost*. ■

Nuclear power in Japan

Start 'em up

TOKYO

The government and voters are putting economics before atoms, opening the way for Japan to restart its nuclear power plants

JUST three years on from the catastrophic meltdown in March 2011 of three reactors at the Fukushima Dai-ichi plant, Japan is taking steps to revive its nuclear dream. A rush to restart some of the country's 48 mothballed commercial nuclear reactors is well under way. Hundreds of technicians from utility firms are camped out in down-market Tokyo hotels, working at the beck and call of the Nuclear Regulation Authority (NRA), the country's new nuclear watchdog, in hopes of meeting new safety requirements. On February 25th the government published a draft energy plan which put nuclear power at the core. It is a sharp reversal of the previous energy strategy, devised by a former government in 2012, eventually to eliminate nuclear power altogether.

The sense of urgency is driven, first, by the mounting costs of doing without the nuclear plants. One by one, nearly all reactors were shut down in 2011-12. Utilities fired up conventional power stations to make up for lost electricity generation. But the cost of importing extra oil, coal and gas has been all the steeper with a weak yen. The trade deficit has climbed, along with electricity charges, particularly for businesses. Should nuclear plants be left idle, the programme of Shinzo Abe, the prime minister, to revive the economy could be in doubt.

Second, the establishment fears that time is running out. A fourth summer



without nuclear power—but also without any sudden blackout to alarm the public—might permanently shift opinion against switching the plants back on. Shigeru Ishiba, secretary-general of the ruling Liberal Democratic Party (LDP), says that people have noticed the lights are still blazing and the trains running. So some 15 months after returning to power, the government is ready to take the political risk of restarts. But it is wary of being thought ahead of the agency charged with nuclear safety.

This month the NRA is due to choose which few reactors it wants to fire up first.

The most modern reactors and those farthest from the Pacific coast and the threat of tsunamis are at the head of the queue, and may be restarted as early as the summer. A favoured candidate is the plant at Oi, on the west coast of the country's main island. Two of its four reactors were the first to restart once before, in the summer of 2012, only to close again in September 2013. Public demonstrations in Tokyo accompanied their return to the grid. At the time Japan had not reformed its lax regime for regulating nuclear power.

Now the government hopes that the NRA, more independent than its ridiculed predecessor, will allay the public's fears. The agency is replacing Japan's shattered myth of absolute nuclear safety with the concept of "defence in depth", that is, multiple back-up plans against a series of worst cases. Several reactors, such as those at Hamaoka, located near Tokyo above the Nankai trough, where two tectonic plates collide, may never restart. But the regulator, understaffed and still susceptible to political pressure, faces a daunting task.

As for the cosy "nuclear village" of utilities, heavy industry, bureaucrats and pro-nuclear media and politicians, it remains largely intact. TEPCO, the operator of the Fukushima Dai-ichi plant, still bestrides the electricity industry, though its credibility with the public is gone. Mr Abe can take comfort from the fact that the anti-nuclear movement appears spent as a political force, despite the backing of a hugely popular former prime minister, Junichiro Koizumi. In the Tokyo governor's election last month, economic concerns trumped nuclear ones.

The very first reactor will be the hardest to switch back on. After that, once the NRA gives the all-clear, local governments hosting nuclear plants will waste no time. During the shutdown their economies have been deprived of generous subsidies from nuclear utilities. The governor of Niigata, which hosts TEPCO's Kashiwazaki-Kariwa plant, the world's largest, is a loud critic of nuclear power. But last September even he gave permission for the utility to press ahead with its plan to restart reactors.

The long-run future of nuclear power is more uncertain. The age of today's reactors means that new ones must soon be built—a detail the government's new energy plan skated over. Along with the Tokyo election, a governor's race last month in Yamaguchi, the southern prefecture from which Mr Abe hails, was closely watched for signs of the mood about new plants. A battle has raged for decades over one to be built in Kaminoseki, a small fishing town in the prefecture. The result, again, was defeat for anti-nuclear candidates. The government has said it may allow three other reactors already under construction before March 2011 to be completed. Just a short time ago, that would have been unthinkable. ■

Sri Lanka

Bring up the bodies

DELHI

Creeping towards an international inquiry into war crimes

EVIDENCE of past atrocities keeps turning up in Sri Lanka. Last year 154 bodies were unearthed from a mass grave behind a hospital in Matale, in the centre of the island—victims, in all likelihood, of an uprising by Marxist rebels in the 1980s. In February an excavation in Mannar, in the north-west, produced 81 bodies, casualties of a bigger and more recent conflict, the long civil war between Tamil secessionists and the state. The police blame the rebels, a cruel and bloodthirsty movement defeated in 2009, for the deaths. But the army is not above suspicion either.

Now comes a small but gruesome find near Mullaitivu in the north-east, the site of awful fighting and massacres in the final months of the civil war. Then, perhaps 40,000 people, many of them civilians, were killed as the army trapped the rebels and fleeing Tamils. Late last month nine skeletons were lifted from a shallow grave in the garden of a family home. The government pins the blame on the Tamil rebels. Tamil activists say that the grave lends credence to claims that the Sri Lankan army has systematically hidden evidence of wartime massacres which it committed in the north and east.

The fate of many Sri Lankans remains unknown. The Red Cross counts 16,000 missing people since 1990, with a surge as the civil war came to an end. Yet the government of President Mahinda Rajapaksa is unwilling to look deeply into the disappearances. The army launched an inquiry which cleared it of wrongdoing. Recom-

mendations from a government-appointed body, the “lessons learnt” commission, achieved little. Last August the president ordered a new inquiry into the missing, which is due to report in August. Critics call it a sham, set up to discourage foreigners from launching more serious investigations. Similarly, official suggestions that Sri Lanka could adopt a South African-style truth-and-reconciliation process appear to be attempts to stall.

Mr Rajapaksa’s administration is only occasionally ruffled. This month, as in each of the past two years, the UN’s human-rights council in Geneva is assessing Sri Lanka’s post-war progress. It will probably conclude that Sri Lanka must do more to account for disappearances, but allow it more time to do so. Last year Navi Pillay, the UN’s commissioner on human rights, toured Sri Lanka and heard of wartime atrocities carried out by both sides, and of government intimidation since. On February 24th she released her draft report to the council, calling for an independent international inquiry, following an effort by experts sent in 2011 by the UN secretary-general. She says she is concerned at the government’s refusal to allow “a credible national process with tangible results”.

This week a British-based group, the Sri Lanka Campaign for Peace and Justice, issued a report with details of rape, torture and murder carried out, it says, by government forces in the north over the past five years. It suggests that such crimes “are still taking place” and warrant foreign scrutiny.

Sri Lanka’s rulers see all this as meddling. In recent speeches Mr Rajapaksa has accused his Western critics of duplicity, talking of law and rights when they really want to do down his country, proud conquerors of terrorists. He expects such talk to go down well with nationalist-minded voters. Sri Lankan diplomats flit to Geneva to deflect criticism. They even suggest that Indian peacekeepers, present in the late 1980s, may have carried out massacres. Ms Pillay is unlikely to get agreement on an international inquiry just yet, but one is inching closer. And it is putting pressure on Mr Rajapaksa to make his own investigative efforts more convincing.

Meanwhile, northern Sri Lanka continues to feel like a land under occupation, with an all-pervasive military intelligence snooping on Tamils deemed to be suspicious. The government says it is cutting by nearly a third the large numbers of soldiers stationed in the north since the war. A successful provincial election in September produced a local government led by a Tamil opposition party. Though it enjoys only grudging co-operation from Mr Rajapaksa, progress towards reconciliation is still possible. But the country’s bloody past has still to be accounted for. ■

Nepal

In the family

KATHMANDU

New prime minister, old habits

IT IS hard to believe that the prime minister, Sushil Koirala, once had the oomph to take part in hijacking an aeroplane full of cash. These days the 74-year-old exudes little energy or confidence. And yet Nepal’s hopes for stability and a constitution rest on him and his party, the Nepali Congress, which narrowly won elections for the Constituent Assembly in November and now leads the government.

Mr Koirala has a prestigious name in Nepalese politics. One cousin was the country’s first elected prime minister, before he was ousted in a coup in 1960. Another cousin, Girija Prasad Koirala, orchestrated that hijacking in 1973, to finance a planned armed insurgency that came to little. He went on to become prime minister four times, between 1990 and 2008.

Nepal’s government and its leader are thus seen by nearly everyone as the return of an old guard. Others in the cabinet, including the finance and home ministers, are familiar faces from the 1990s, too. That is hardly reassuring: this era is remembered for corruption, ineffective rule and the brutal mishandling of a nascent Maoist



His family wants to know



Sushil Koirala: familiar face

rebellion which only helped it spread through the rugged countryside. Maoists went on to wage a decade-long civil war, in which they sought (and eventually achieved) the overthrow of the monarchy and the promotion of the interests of the lowest caste. The war ended in 2006.

Today the ruling party seems not to think that lower castes matter much. The powerful ministries are all run by high-caste men, marking a return to earlier times and a failure to reflect the country's diversity. Though *dalits*—once known as “untouchables”—account for nearly one in six of Nepal's 28m people, Mr Koirala's party fielded none in the election, and none sits in his cabinet.

“It's as if there was no movement in 2006, and no Maoist insurgency for ten years before that,” complains an activist leader, Devendra Raj Pandey, referring to street protests in the capital, Kathmandu, that helped to bring an end to the war. Mr Pandey, like many educated types, says he would like to support the Nepali Congress, but is put off by the party's failure to share power with lower castes or devolve it to local bodies. Nonsense, a defender of the party retorts. He says it now supports both republicanism and federalism, a sharp change from the 1990s, when the monarchy still existed.

At least a cabinet exists, after much wrangling for plum posts among party factions and a junior coalition ally. The government says it plans to get a long-delayed new constitution written and then hold a new election for president—all within a year. In theory this is possible, since much of the constitution is agreed upon. But Mr Koirala may not rush to put himself out of a job. And other Nepalese politicians are not notable for their work ethic. Mr Koirala is not the only one short of oomph. ■

Thailand's protests

Dismantling the barricades

BANGKOK

The action moves to the courts as anti-government protests fizzle

AT LAST it looks as though the street protests designed to oust Thailand's prime minister, Yingluck Shinawatra, are running out of steam. After more than four months of relentless sit-ins and government shut-downs, the leader of the insurrection, Suthep Thaugsuban, has dismantled most of his various protest sites around the capital, retreating to a single encampment in central Bangkok. His supporters are dwindling in number, and so is their appetite for further confrontation. Yet Ms Yingluck is by no means home and dry. The courts may yet succeed where Mr Suthep has not.

Lumpini Park is the new headquarters of Thailand's failing people's revolution. Self-appointed guards protect the tented city. As in Mr Suthep's previous makeshift sites there are tea stalls, showers, television-viewing areas, a medical centre and a shortage of lavatories. Well-off Bangkok residents distribute food from luxury cars to the protesters, many of them bused in from southern Thailand. Although the protests no longer occupy the same locations as before—a posh shopping district and the sites of public monuments—the slogans are unchanged. “Evolution before elections” reads one sign affixed to a tent; “This corrupt government must be overthrown”, another.

Rhetorically, at least, Mr Suthep and his People's Democratic Reform Committee remain as defiant as ever. Many protesters vow that they will pack up and leave only when all traces of Ms Yingluck and her brother, Thaksin Shinawatra, the former prime minister ousted in a coup in 2006, are removed from the body politic. But their hopes now look forlorn of using protest power to force on Thailand a “people's council” to replace the elected government. The government appears to have outsmarted the protesters. By refusing to confront them directly, the government largely averted violence and avoided giving the army a pretext to intervene on Mr Suthep's behalf to “save” the country, democracy or anything else.

Some have suggested that the two sides may now sit down together to negotiate a way out of the impasse. But that ignores how little Ms Yingluck—along with Mr Thaksin, who pulls the strings from exile in Dubai—has to gain from talks. The prime minister's position has been buttressed by victory in a recent snap election. Her supporters in the Shinawatra family's political heartland in the north and north-east have

been steadfast. With Mr Suthep's power on the wane, she may calculate that there is no need to give him the renewed political significance that talks would confer.

Ms Yingluck now has more reason to worry about the courts than about Mr Suthep. The judiciary has brought down Thai governments before. Given the number of legal challenges being mounted by opponents of the prime minister and her government, it would be surprising if one or other of them did not hit home.

Take, for instance, the February 2nd general election, which was boycotted by the main opposition Democrat Party. One legal challenge attempted to have the whole election declared invalid. The government survived that. But protests prevented elections being held in 18 of 77 provinces—and attempts to rerun those votes are going less well. Five provinces managed to hold elections on March 2nd. The remainder are planned for next month, but these are now the subjects of court procedures. Legal scholars and others challenge the right of Ms Yingluck's current “caretaker” government to carry on ruling much longer without an official quorum convened in parliament.

More pressingly, Ms Yingluck has until March 14th to defend herself before the National Anti-Corruption Commission on criminal charges over alleged dereliction of duty arising from the government's disastrous scheme to help farmers by subsidising rice. She has sent lawyers to the commission to hear charges, but has yet to offer her account of the facts. If the commission does indict her, she may have to step down. The government has said that in such an eventuality another minister could take over her job. Still, for Mr Suthep and his supporters it would undoubtedly be a welcome fillip. ■



But still no new broom in government



Terror attack

Dark day

KUNMING

A brutal knife attack shocks China and raises questions about its policy towards ethnic minorities

“THIS should not be. It just should not be. I don’t understand.” Uttering these words as he tried to hold back tears, a retired train driver stood before a makeshift shrine in front of Kunming railway station, where on the evening of March 1st a group of assailants, clad in black and wielding long knives and cleavers, unleashed terrible carnage.

They stabbed and slashed indiscriminately, witnesses say, and sent people running frantically from the mayhem. It was over in a matter of minutes, but not soon enough. At least 29 people died and 140 were injured in the attack, which state media have called “China’s September 11th”. Authorities say it was an act of terrorism carried out by “Xinjiang extremists”, by implication ethnic Uighurs, a Muslim minority group from the north-west.

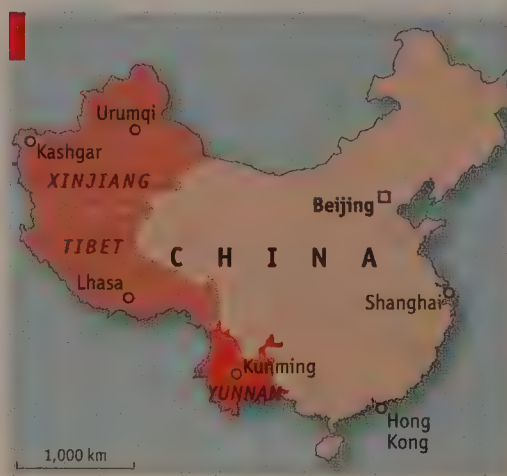
According to police, four attackers were killed on the spot and one—a woman, who was injured—was captured. Two days later police said that three more had been detained, and that the search for the perpetrators was over.

Except for the gun-toting police and the presence of the shrine—where people come to bow and offer flowers and fruit to honour the victims—the station has returned almost to normal, as the bustling hub of a second-tier city of 6m people. But the impact of the attack, on Kunming and on China, may be far-reaching. It could mark a disturbing escalation of China’s

long-festering problem of ethnic tension.

Violence has occurred sporadically for years in Xinjiang, where most of China’s 10m Uighurs live and bristle under heavy-handed rule from Beijing. Uighurs are more like Central Asians in their culture and religion than like Chinese.

Most just about rub along with their Han Chinese neighbours, who now make up 40% of Xinjiang’s population. But discontent occasionally surfaces in the form of attacks with low-grade explosive devices and knives. In July 2009 nearly 200 people died in inter-ethnic riots in Urumqi, Xinjiang’s regional capital. In recent months, the number of attacks against security personnel has increased amid a broader official crackdown on religious and cultural practices, which China’s lead-



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ers worry fuel Uighur separatism.

Only recently has violence looked like spreading to other parts of the country. In October five people died and dozens were injured in Tiananmen Square in Beijing, when a sport-utility vehicle crashed into pedestrians in front of the iconic portrait of Mao Zedong. Authorities also called that a terrorist attack and blamed it on a group, about which little is known, called the East Turkestan Islamic Movement. (East Turkestan was the name of a short-lived independent state in the region in the 1940s and is the name many Uighurs prefer over Xinjiang, the Chinese name.)

No group claimed responsibility for the Tiananmen crash, nor has anyone done so for the Kunming massacre. Apart from eyewitnesses describing what they saw, there has been no independent way to confirm the details given by the authorities, including claims that black flags adorned with crescent moons and other evidence associated with “East Turkestan terror forces” were found at the scene.

The bloodletting comes as a particular shock for Kunming. The city is the capital of Yunnan, which, despite being one of China’s most ethnically diverse provinces, has a reputation for tolerance and has suffered little of the turmoil familiar to Xinjiang or Tibet, another of China’s ethnic hotspots.

In Kunming’s main Uighur enclave, a district called Dashuying, residents say the attack does not bode well for their future. “The Chinese have always looked down on us, but it was bearable,” says Abdurkhan Khadar, a native of the Xinjiang city of Kashgar and owner of a Kunming flatbread bakery. Now, although nobody seems to think the killers came from his district, “the attitude of Han people has suddenly got even worse”. Stacks of flatbreads are piled in his shop. Since the at-

▷ tack his Han customers have stayed away. The police presence in Dashuying has also increased. Large vans guard intersections near the district, and police in full riot gear patrol the narrow alleys.

Most Han Chinese have reacted with bewildered horror. Always told that minorities receive preferential treatment in education and family planning, and with nothing ever reported in the Chinese press about the suppression of minority culture and religion, many Han are left wondering why the Uighurs are so angry. Some, along with the government, also feel annoyed at the perceived reluctance of foreign media and governments to call the attack terrorism. An American official finally said on March 3rd that, based on information in the Chinese media, "it appears to be an act of terrorism". ■

China's parliament

The smog of war

BEIJING

The prime minister opens parliament by declaring pollution the enemy

THE annual session of China's rubber-stamp parliament, the National People's Congress, is rarely remarkable for the rhetorical flourishes of the leaders who address it. But at the opening on March 5th of this year's nine-day meeting the prime minister, Li Keqiang, in his maiden speech, deviated at least a little from the usual stodgy fare. China, he said, must "declare war" on pollution. The blanket of smog that often shrouds much of the country, he said, was nature's "red light", warning about the risks of "blind development". Growing public furore about pollution has at last goaded China's leaders into admitting the urgency of the problem.

On February 21st the capital issued its first "orange" smog alert since it introduced a new four-tier warning system last October, with orange as its second-highest level. The warning meant schools were supposed to suspend outdoor activities. As the noxious haze lingered, microbloggers expressed outrage that a top-level "red" alert was not issued. Many accused the government of failing to deal with the smog.

Such criticism has clearly stung. Mr Li's state-of-the-nation speech dwelt on the problem of air pollution much more than those of his predecessors. He acknowledged that smog was affecting an increasingly wide area and said authorities would fight pollution "with the same determination with which we battled poverty".

That may be an unfortunate comparison, much of China's success in dealing with poverty having been a by-product of

America's departing ambassador

No love lost

SHANGHAI

The Communist Party takes a parting shot at Gary Locke

ON AUGUST 18th 1949, an essay written by Mao Zedong entitled "Farewell, Leighton Stuart!" was published. The text was a parting shot at the American ambassador, who was leaving amid escalating tension with the nearly victorious Communist Party. In the essay Mao accused Stuart of deceiving the Chinese and presented him as a symbol of failed American imperialism. Stuart's departure signalled the end of diplomatic relations between the countries for more than two decades.

On February 27th a writer called Wang Ping penned a column for China News Service, an official agency, entitled "Farewell, Gary Locke!" It was a scathing critique of American foreign policy during Mr Locke's two-and-a-half-year tenure as ambassador to China. In it, Mr Locke, who is Chinese-American, is called "a banana" who used his "yellow skin and white heart" to advance American ambitions. He is accused of "inciting evil winds" and "lighting evil fires" through visits to restive regions like Tibet and Xinjiang, and of being a "guide dog" for Chen Guangcheng, a blind activist whose asylum in America he engineered. The article continues: "After a while, a banana will inevitably start to rot".

Many Chinese citizens disagree. Mr Locke is remembered primarily for his man-of-the-people humility. In 2011, as he arrived in China, photographs of him buying his own coffee circulated on social media, as did descriptions of him carrying his own luggage. Chinese microbloggers marvelled at such unassuming

behaviour, in contrast with the pomp that attends most Chinese officials. Mr Locke's activities were "like a slap in the face of those authoritarians", wrote one.

Perhaps what prompted the article was Mr Locke's final speech in Beijing on February 27th. He said he was proud of his Chinese ancestry but also "proud of the great values that America stands for". He urged China to fortify the rule of law and protect human rights. China "should have the national self-confidence to withstand the media scrutiny that most of the world takes for granted", he said.

In 1949 Mao tried to discredit Stuart partly because of concern about America's influence on Chinese intellectuals. Such anxieties, it seems, persist.



Banana splits

the same rapid growth that has wreaked environmental havoc. But Mr Li is not aiming for another boom. He said China's GDP would grow this year by about 7.5%, slightly slower than last year's rate of 7.7% and considerably below the double-digit rates of the first decade of the century. He said that plans to shut down "backward" production facilities in the steel, cement and glass-manufacturing industries would be completed a year earlier than forecast.

Mr Li also said the amount of energy consumed per unit of GDP growth would be cut this year by 3.9%, after a 3.7% drop last year. He omitted to mention that coal consumption, China's biggest source of energy and a major cause of smog, is expected to continue rising. But he did say that emissions of sulphur dioxide (which result from burning coal and contribute to smog) fell by 3.5% last year and would drop an-

other 2% this year. Smog notwithstanding, researchers at Harvard University last year said China's cuts in sulphur-dioxide emissions in recent years may have been "one of the most swiftly effective air-pollution policies ever implemented anywhere".

In recent days internet users have heaped scorn on a Chinese general who said on state television that smog might protect China from attack by American laser weapons. Mr Li wisely avoided repeating the claim. But his government is not scrimping on defence. A draft budget submitted to the legislature calls for a 12.2% increase in military spending this year (up from 10.7% last year); overall government spending will rise by 9.5%. In a pointed jab at Japan, he said that China "would not allow anyone to reverse the course of history". The war on pollution was, however, the only one he declared. ■

Banyan | Murky business

Prospects for agreement on Hong Kong's political future do not look bright



PEERING from a 46th-floor vantage-point at the other spectral skyscrapers puncturing the murk, a Hong Kong resident grumbles out loud to no one in particular about the smog. "Still", he muses, "It's not as bad as Beijing." Political debate in the territory is now conducted on similar lines. Disappointment is mitigated by low expectations, and the national capital sets the standards. Those arguing that Hong Kong's 7m people deserve and need full democracy do not expect to get it. And they fear that the freedoms Hong Kong has enjoyed under both British and Chinese sovereignty, despite its unrepresentative government, are being slowly whittled away. But at least it's not as bad as Beijing.

As the National People's Congress opened there this week, Chinese spokesmen reiterated that 2017 is to be the year when China keeps a promise to Hong Kong made in the Basic Law, the constitution it adopted on its reversion to Chinese sovereignty in 1997: that Hong Kong's chief executive will be chosen by "universal suffrage". Today's chief executive, Leung Chun-ying, was anointed by a 1,200-strong election committee dominated by interests sympathetic to the Chinese government.

Electoral reform, however, may not be as radical as that sounds. The Basic Law also stipulated that candidates will be nominated by "a broadly representative nominating committee". Pro-democrats fear, with good reason, that any such body will simply replicate the rigged election committee, and that Hong Kong's voters will be presented with a choice between a handful of candidates acceptable to China. If so, 2017 would not be very different from 2012, when Mr Leung, who was probably China's second choice, won after the favoured candidate proved utterly hapless. The terms of the debate as set by China seem to portend endless wrangling over how the nominating committee might be expanded and become a bit more representative.

An alliance of pro-democracy parties wants to dodge this by adding new methods of nomination—by political parties and by the general public. The government and Chinese spokesmen insist this is just not on, since it would contravene the Basic Law. It is not only the "pro-democracy" camp that is gloomy. In an article this week to mark the halfway point of a five-month government consultation exercise on the election, the head of the civil service, Carrie Lam Cheng Yuet-ngor, wrote that the chances of "the suc-

cessful implementation of universal suffrage" were "not very bright, though the prospect is not yet completely bleak." It looks doubtful whether any compromise is possible that could win the two-thirds vote it would need in the Legislative Council, where pro-democracy politicians hold 27 out of 70 seats.

The campaign for "universal suffrage"—taken to mean the right to elect any candidate—resonates beyond the pro-democracy political parties. Last year it was joined by an "Occupy Central" movement, inspired by "Occupy Wall Street" and organised by some academics, including Benny Tai Yiu-ting, a law professor at the University of Hong Kong. It involves exhaustive "deliberative" open meetings and Occupy Central plans to hold an online "referendum" in June on the proposal these produce.

This is intended to influence the government's own plans. If, when they are published, these are deemed unsatisfactory, the group threatens to deploy 10,000 people to occupy Hong Kong's Central district, paralysing commerce. The threat has drawn dire warnings from the government and mainland-Chinese press. It has also prompted the formation of groups opposing the Occupy movement. Perhaps recalling what happened when protesters occupied the heart of Beijing in 1989, and how badly they underestimated the scale of a massive demonstration in Hong Kong in 2003, officials have foretold civil strife with a cataclysmic effect on Hong Kong's reputation. Mr Tai says he hopes to make China more afraid of the consequences of the potential occupation than it is of the risk of having an open election.

The relative simplicity of the demand for the right to choose Hong Kong's leader, after three decades of arcane haggling about obscure ways of rigging elections, brought a façade of unity to the fissiparous pro-democracy camp, at least for a while. That is now cracking, as the government drags out the process. Even some of Occupy's backers concede that many ordinary people in Hong Kong are now as fed up with democracy activists as they are with the government in Beijing.

Street life

Yet, as is to be expected in a place that enjoys the freedom of association but limited democracy, Hong Kong is used to street protests. The biggest of these in recent weeks have been in defence of another freedom—that of the press. On March 2nd several thousand joined a march in response to a vicious knife attack on February 26th on Kevin Lau Chun-to, who was until early this year editor-in-chief of *Ming Pao*, a daily newspaper. Many journalists pointed to a handful of earlier violent incidents involving the press and saw the attack as intimidation of the profession as a whole. They also argue that, regardless of the threat of violence, press freedom is already circumscribed. Tycoon owners ensure self-censorship to protect their business interests in China. Awkward journalists seen as "anti-China" are sidelined.

Similarly, China might not need to rig an election to ensure that an acceptable figure wins it. Both Mr Tai and Joseph Cheng, convener of the pro-democracy alliance, believe that a candidate whom Chinese leaders excoriated as unacceptable would have little chance of winning an election. Even so the government seems not to want to set the rest of China an example of a free one. And, though Hong Kong's people have long been lauded for their "pragmatism", China seems not to trust them. The feeling is mutual. In fact, as people march in support of a free press, and take part in the annual vigil on June 4th to mark the 25th anniversary of the Tiananmen massacre, it may even be intensifying. ■

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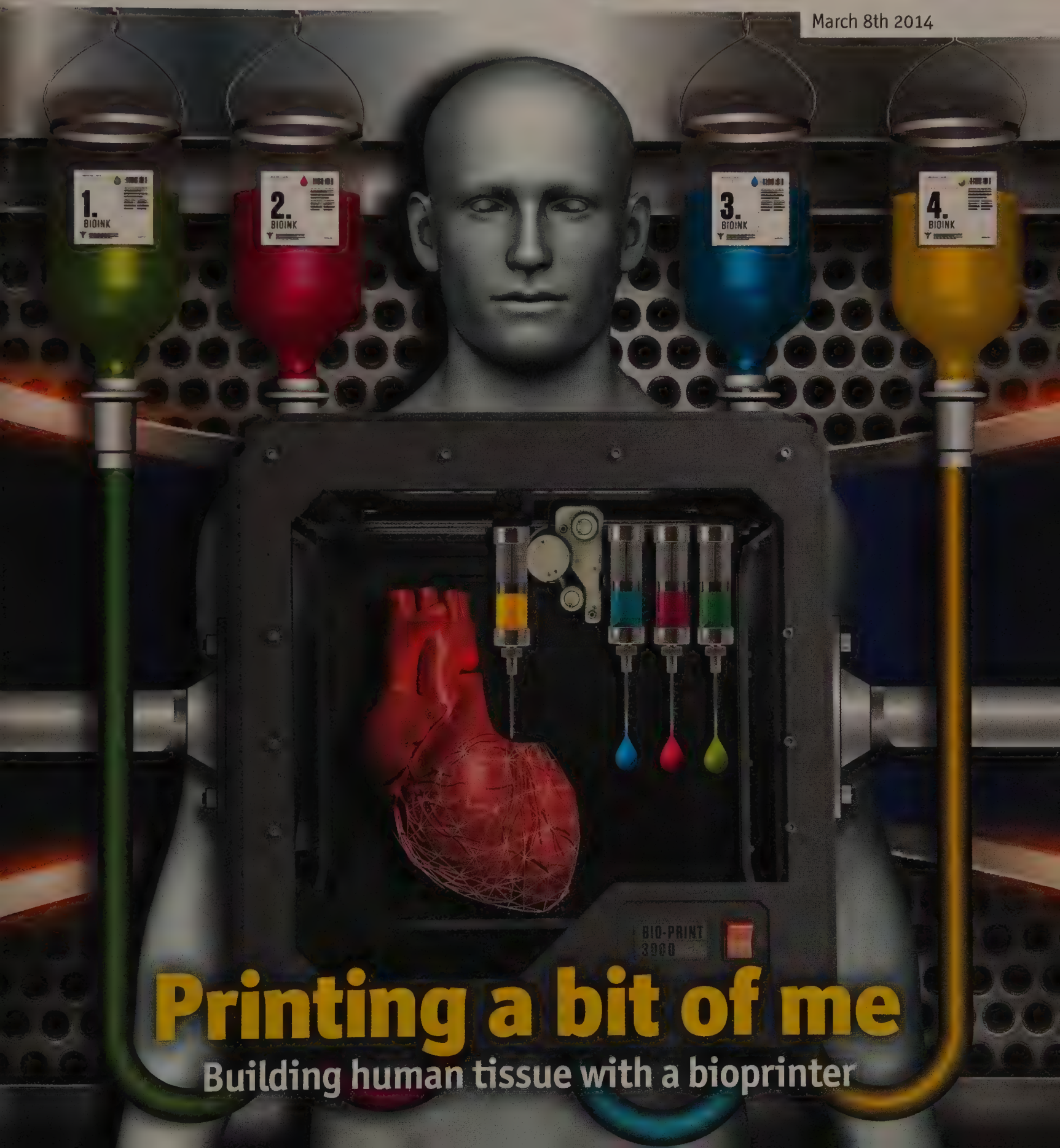
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leaves the valley

Catapults
power up

Making things
with viruses

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March 8th 2014



Printing a bit of me

Building human tissue with a bioprinter

PLAY TO WIN.



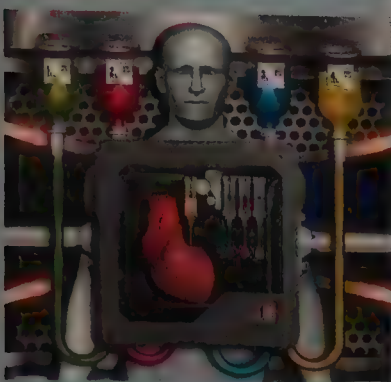
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Ghost ships

Marine technology: Autonomous cargo vessels could set sail without a crew under the watchful eye of captains in shore-based simulators

MILITARY drones already fly frequent missions and civilian operations using unmanned aircraft are coming. Driverless cars are clocking up thousands of test miles. So why not let remote-controlled ships set sail without a crew? Indeed, the maritime industry has started to think about what would be required to launch a latter-day *Marie Céleste*.

Ships, like aircraft and cars, are increasingly controlled by electronic systems, which makes automation easier. The bridges of some modern vessels are now more likely to contain computer screens and joysticks than engine telegraphs and a giant ship's wheel. The latest supply ships serving the offshore oil and gas industry in the North Sea, for instance, use dynamic positioning systems which collect data from satellites, gyrocompasses, and wind and motion sensors to automatically hold their position when transferring cargo (also done by remote control) to and from platforms, even in the heaviest of swells.

However, as is also the case with pilotless aircraft and driverless cars, it is not so much a technological challenge that has to be overcome before autonomous ships can set sail, but regulatory and safety concerns. As in the air and on the road, robust control systems will be needed to conform to existing regulations.

The maritime industry is interested in crewless ships for two reasons. The first is safety. Most accidents at sea are the result of human error, just as they are in cars and planes. So, if human operators are replaced by sophisticated sensors and com-

puter systems, autonomous vessels should, in theory, make shipping safer.

The second reason is, of course, cost. It is becoming increasingly difficult to sign up competent crew prepared to spend months away at sea. Moreover, some voyages are likely to get even longer for ships carrying non-urgent cargo. By some accounts, a 30% reduction in speed by a bulk carrier can save around 50% in fuel. This means slower steaming could provide big savings in fuel costs, but it would be at the expense of increased expenditure on crew for these longer voyages, both in wages and for the "hotel" facilities required on board. Removing the crew, though, also removes the need for their accommodation and its associated equipment, like heating and plumbing. And that provides room to carry more cargo.

Ahoy there!

The transition to unmanned ships could take place in steps, says Oskar Levander, head of engineering and technology for the marine division of Rolls-Royce. Crews would be reduced as some functions are moved onshore, such as monitoring machinery. (The engines on jet aircraft are already overseen by ground stations.) This could be followed by some watchkeeping and navigation duties. Experienced crew might be put on board when ships leave or enter port, just as pilots are to navigate. And a small maintenance crew could be kept for the voyage until remote-control systems prove themselves. A fleet of autonomous ships could also sail in convoy ►►

▶ with a manned vessel in the lead (as illustrated on the previous page).

The onshore control rooms would keep an eye on ships thanks to live data transmitted from vessels, including video and infra-red images. Object-recognition software, combined with radar, would further automate the process. If an alarm was raised the skeleton crew on board could be alerted or the control room take charge, probably from a bridge in a simulator. Rolls-Royce already operates virtual ships' bridges, with 360° views, for the training of officers and crew. These are realistic enough to make landlubbers feel seasick.

Using onshore control rooms and simulators a team of ten land-based captains could operate 100 or so ships, reckons Mr Levander. The captains could commute from home for their shifts just as the pilots who fly military drones do. Passenger ships are likely to remain crewed, however. Trained personnel are needed to manage evacuation procedures, and in any case passengers are unlikely to want robots and vending machines attending to their needs.

The slower-sailing bulk carriers could be the first ships to be automated, according to the Maritime Unmanned Navigation through Intelligence in Networks (MUNIN) project, a European Union initiative backed by a number of industrial organisations. Like others, it says the ability of drone ships to detect other vessels and take avoiding action will be crucial, but possible with advanced technology and improved backup systems.

Rules of the sea

With a captain technically in command—even though he is based in an onshore control room—MUNIN thinks the legal and practical challenges of meeting maritime rules could be met. Radio messages from other ships, along with those from coastguards and port authorities, could be automatically routed to the shore captain. Something similar is being proposed for autonomous civil drones, with ground-based pilots responding to communications and air-traffic control instructions as if they were in the cockpit.

In many ways automating a ship should be a lot easier than automating aircraft, Mr Levander believes. For a start, if something did go wrong, instead of falling out of the sky a drone ship could be set by default to cut its engines and drop anchor without harming anyone. As for piracy, with no crew to be taken hostage it would be much easier for the armed forces to intervene. Of course, more modern pirates might try to hack their way into the controls of an autonomous ship to take command. Which is why encrypted data communication is high on the maritime industry's list of things to do before ghostly vessels ply the trade routes. ■

Going with the flow

Giant batteries: The missing piece of the renewable-power jigsaw may now have been found in the form of a new type of flow battery

THERE is nothing so expensive, some cynics suspect, as free fuel. It is not that turning wind and sunlight into electricity is itself that costly, provided you pick the right places to do it. But it is not reliable. The wind does not always blow, and even in the most cloud-free desert night falls with monotonous regularity. Political commitments to use large quantities of renewables, such as several European countries have made (see following story), thus risk the lights going out. The search therefore has been on for a cheap way to store energy transduced from sun and wind when it is plentiful, so that it can be used when it is not.

Many approaches have been proposed: pumping water from lowlands into mountain lakes serving hydroelectric plants; filling hermetically sealed caves with compressed air; creating arrays of giant flywheels; even storing electricity in huge superconducting rings. The most obvious, though, is to use batteries—if only they could be made big enough and cheap enough.

Advocates of this idea are particularly enamoured of a design called a flow battery, in which two liquids, each in contact with an electrode and separated by a membrane that is permeable to hydrogen ions, jointly store the energy put into the battery when it is charged up. They do this

in a pair of chemical reactions that push hydrogen ions through the membrane without the liquids coming into direct contact. Then, later, the liquids can be made to release the stored energy by transferring hydrogen ions back through the membrane. This generates electrons, which flow through an outer circuit to do useful work such as lighting people's houses. The discharged liquids are then available for recharging.

Because the energy-storage media of such batteries are liquid, they can be pumped into holding tanks once charged up. Flow batteries can thus, in principle, sequester huge amounts of energy. But they will solve the renewable-storage problem only if they can be made of cheap material, and at the moment they are not. The storage media require salts of expensive metals such as vanadium, and the electrodes sometimes have to be coated in platinum, or similarly rare catalytic metals, if the whole caboodle is to work. Which is where Brian Huskinson, Michael Marshak and their colleagues at Harvard University come in. They think they have worked out a way to make both the liquids and the electrodes cheap.

A new brew

The solution Dr Huskinson and Dr Marshak propose, in a paper in *Nature*, is to use molecules called quinones, mixed with sulphuric acid, on one side of the membrane, and a mixture of bromine and hydrobromic acid on the other—and to make the electrodes out of carbon.

Quinones are molecules composed of carbon, hydrogen and oxygen that ionise in similar ways to metals like vanadium. Anthraquinones—the class of quinone employed by Dr Huskinson and Dr Marshak—can be synthesised cheaply because their precursor, anthracene, is a component of crude oil. And anthraquinones



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▶ already have a number of industrial applications, for example in the paper-pulp industry. This means an infrastructure to make them already exists. The question was, would they be as good as vanadium in a battery?

Dr Huskinson and Dr Marshak found that, with a suitable material on the other side of the membrane—namely the bromine/hydrobromic acid mixture—they were. The anthraquinone they chose, called AQDS, reacts with the sulphuric acid in a way complementary, with a suitable transfer of hydrogen ions, to the way bromine turns into bromide ions, the non-hydrogen part of hydrobromic acid. And it does so without the need for a metal catalyst.

This particular flow battery is just a proof of principle. But it is an important one. Being able to use organic molecules instead of metals changes the battery-making game completely. If battery-makers have to use metals, they are restricted to what the periodic table offers. Using quinones they can tweak their materials by adding and subtracting atoms to get the properties they want.

That, plus the low cost (Dr Huskinson and Dr Marshak estimate \$21 per kilowatt-hour of storage capacity for the AQDS and a further \$6 for the bromine and hydrobromic acid, as against \$81 for a vanadium-based system even before any platinum electrodes used are taken into account), means the future looks bright for quinone-based flow batteries—and thus, by extension, for renewable energy. ■

Can parallel lines meet

Power transmission: How to build a real supergrid by making existing electricity lines more efficient at transmitting power

GERMANY has a problem. The decision, taken in 2011, to close down the country's nuclear-power stations risks leaving parts of the country with insufficient supplies of electricity. This means power will have to be brought in from elsewhere. But to do that seems, on the face of things, to require the building of new transmission lines, which will be unpopular with those they pass by.

One alternative is to make better use of existing lines. In theory, the simplest way of doing so would be to run direct current through them, instead of the existing alternating current. AC transmission has long dominated most grids because the higher voltages needed to boost energy



transfer can be more readily stepped up and down again. But AC suffers transmission losses in a way DC does not, which even in efficient euro-zone grids is around 6%. With newer technology, however, the transmission of high-voltage DC would reduce those losses and thus provide more capacity, but it is technically awkward.

Now, however, an experiment by Amprion and TransnetBW, two German electricity-transmission firms, suggests it could be easier than engineers had feared. If true, this not only solves Germany's local problem, it could also lead to the construction of a European supergrid to carry solar energy from the sunny south, and wind energy from the stormy west, to the continent's industrial heartlands.

The difficulty the transmission companies face is that they need to have their cake and eat it. They want to transmit power 400km along an existing line from North Rhine-Westphalia, which has a surplus generated by conventional means, to Baden-Württemberg, which relies on Philippsburg 2, a nuclear-power station that will shut, unless there is a change of policy by the end of 2019. Although using DC is the best way of doing so, they also have to keep some AC capacity on the line, since that is more useful for local purposes. This means having parallel cables hanging from the pylons, some carrying AC and some DC.

That does not sound too hard to a layman. But the firms' engineers feared the electric fields surrounding the adjacent cables might interfere with one another. This could happen in three ways: capacitance, induction and resistance. Calculations suggested the first two should not be problematic, but the third might well be—and might wear out the transformers which are used to step the current down from its transmission value of around

400,000 volts to the more manageable values used in homes and offices. Experiments on an unused line, however, suggested this does not happen. The only things that need be changed are the insulators. Doing that will be much easier than building a whole, new line.

Euro lines

If it were just a question of solving a little local difficulty, this discovery would have limited significance. But that is not the case. It actually opens up the possibility of moving a lot more electricity around as DC, with a resulting increase in grid capacity, in what the engineers refer to as an ultranet. This should reduce the need to build new lines to connect the continent's burgeoning wind and solar generating plants to the cities. Such connections would also help balance supply, helping to iron out some of the inevitable variation the weather brings to both wind and solar power.

The actual conversion of the North Rhine-Westphalia to Baden-Württemberg line is now scheduled for 2019. Electrical engineers everywhere will be looking on with interest. ■

Quantum quantified

High-speed computing: Although it works, a much-hyped quantum computer fails its toughest speed test yet

QUANTUM computers are a grand idea. By harnessing the famous strangeness of quantum mechanics, they should be able to perform some (though not all) calculations far faster than any ordinary computer. But building one has proven tricky. The idea was first floated in the 1970s. Four decades later quantum computers are still small, fragile devices confined to the laboratory bench—with one exception. In 2011, to great fanfare, a Canadian firm called D-Wave announced a commercially available quantum computer, the \$10m D-Wave One. Deals with Google, NASA and Lockheed Martin, a weapons firm, followed.

Admittedly, D-Wave's device is a very specialised sort of computer, restricted to a single area of mathematics called discrete optimisation. But it was big news, and many scientists were rather sceptical. In the past couple of years the firm has published enough papers about its device to convince academics that it has indeed built a quantum-mechanical machine. Now the question is whether it is any



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► quicker than the competition.

One set of benchmarks, published in May, suggested that it was: they found that D-Wave's machine was up to 3,600 times faster than its non-quantum rivals. But it was not quite a fair fight, for the classical machines were running off-the-shelf programs. With a bit of clever tweaking, they could have been made much faster. When a group led by Matthias Troyer, a computer scientist at the Swiss Federal Institute of Technology, tried such souped-up algorithms, they found that D-Wave's lead vanished. D-Wave, in turn, pointed out that the researchers had been using an old version of its system.

Now Dr Troyer and his colleagues have re-run the analysis, this time using the most up-to-date D-Wave system available. In a paper posted to *arXiv*, an online repository, they report that, on average, there is still no sign that D-Wave's machine offers a performance boost. Averages may disguise many things, and there are cases in which the D-Wave device is up to ten times faster than an ordinary chip. But there are also cases in which it is around a hundred times slower. And, tellingly, while both the classical and quantum machines get slower as the problems they are asked to solve become more complicated, they seem to slow down at roughly the same speed.

The Google view

Shortly after the paper was published, Google's Quantum Artificial Intelligence Lab, which has been playing with a D-Wave machine, published some thoughts of its own. It admitted that non-classical machines seem to be able to match the quantum device's pace. But it had some suggestions for greasing the quantum wheels, such as improving D-Wave's chips by allowing more of their quantum-mechanical bits to connect to each other—admittedly, a far-from-trivial task. And it speculated that an unambiguous advantage for the quantum machine might be lurking somewhere in the roughly 400,000 benchmarks it has already performed. (On the other hand, one might presume that any really significant speed-up would have been spotted already.)

Troels Ronnow, one of Dr Troyer's colleagues and the new paper's lead author, tries to be fair. The research has a lengthy discussion about how best to compare quantum computers with classical ones, and lists pitfalls that it carefully avoids. Echoing the Google team, he speculates that tweaks to D-Wave's hardware—such as improving its error-correction—might bring benefits. And he concedes there may be other problems, besides his synthetic benchmark, that the machine does better at. But it might also be that D-Wave's device is simply no faster than a well-tuned non-quantum machine. ■

Find dining

Truffle farming: How mapping technology is being used to discover new places to grow savoury and expensive fungi

PIGS, dogs and rakes can all be useful in the quest to discover wild truffles, but each has its drawbacks. Pigs like to gobble up the fancy fungi as much as their owners do. Dogs are costly to train. Rakes wreak havoc on the duff (leaf litter) that often covers truffle-rich soil, thus damaging the fungi's environment. Truffles are, nevertheless, successfully being unearthed in areas not traditionally associated with their growth.

Some of Oregon's truffles, for example, are fetching \$400 a pound (0.45kg) this season. But that is still less than half the cost of some Italian and French ones.

Agriculture, though, usually triumphs over hunting and gathering. Truffle orchards—patches of woodland where the fungi have been deliberately introduced—are popping up around the world. Chile, China and New Zealand all have them. But their success is a bit hit and miss, so a way of identifying where truffles will thrive would be welcome.

That is where Symbios, a company based in Oregon's northern neighbour, Washington, comes in. Its staff have been working with the Pacific Northwest National Laboratory, in Richland, to develop a way of mapping land that can tell the firm where best to grow black Périgord truffles, generally regarded as France's most exquisite variety.

First, the company contacted particu-

larly successful producers of black Périgords in both Europe and Australia. This way, its researchers gathered a set of data about places where these fungi grow well. They then analysed what they found using 11 variables: climate, geology, altitude and eight others that the firm's president, Jean Buckner, is keeping up her sleeve. That let them work out what constitutes a good site for a truffle orchard.

Armed with this knowledge, the firm used a range of geographical information systems (such as Google Earth) to create a series of maps of a given area, each showing which places have the right values for one of the ten variables. Lay the maps on top of one another, and the parts where enough appropriate values overlap are the ones in which you should plant truffles.


The final map ranks sites from one to ten, according to how suitable they look. When the entire group of 11 variables was analysed, 2.2% of Tennessee was awarded the highest possible score. It was the first state Symbios mapped this way, but the company has plans to do the same for California, Oregon and Washington.

Once the most promising locations have been pinpointed, the firm can find out who owns the land, and begin negotiations. If these prove fruitful, the site will then need to be explored on foot, to determine precisely where the soil's chemistry and density are best suited for a truffle grove. According to Dr Buckner, Périgords in general prefer "fluffier" soil.

Symbios is also looking at ways of using mapping technology to find wild truffles, and into developing an electronic nose that sniffs them out using infra-red sensing, which might provide an alternative to snuffling with pigs and dogs. Its technique could also have wider application, allowing the identification of suitable sites for other crops that are finicky about where they live, such as varieties of the quinoa grain and pinot-noir grapes. ■



A truffle snuffler at work



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Aerial jellyfish

Ornithopters: Flying like a bird has long captured the imagination. The latest way to do so is copied from the ocean, not the atmosphere

ENGINEERS often look to the natural world for inspiration—and flight engineers, doubly so. Mankind's desire to soar like the birds directly inspired the Wright brothers' solution to the problem of controlling a heavier-than-air flying machine, by suggesting the way to do so was to warp the shape of the craft's wings. More recently, designers of ornithopters (tiny, robotic flying machines lifted by flapping wings) have looked to insects for inspiration, and built systems of sensory feedback that can keep aloft designs which are essentially unstable.

It would be better, though, if those designs were not unstable in the first place, so that any on-board electronics (all of which contribute to a craft's weight) could concentrate on the more useful task of piloting the thing to its destination, rather than merely keeping it in the air. And that, by looking at a rather different natural model, is what Leif Ristroph and Stephen Childress of New York University think they have done.

Their ornithopter, described in the *Journal of the Royal Society Interface*, resembles not an insect, but a jellyfish. As Dr Ristroph and Dr Childress note in their paper, this is not the first time flight engineers have used an aquatic rather than an aerial model, for only waterborne creatures (squid, for example) use jet propulsion. Their device, rather than having a continuous bell as a real jellyfish does, relies on four leaf-shaped wings. But that is mainly to simplify the construction, for it means the wings can be rigid (they are made of Mylar films, stretched on tough carbon-fibre frames).

Each wing is 8cm long. The pointed ends of the leaves meet at the apex of what is basically a cone-shaped device, and the wings are held in place relative to one another by a flexible carbon-fibre ring that connects them. Opposite wings, pulled via carbon-fibre threads by a small electric motor, beat simultaneously and out of phase with the other pair of wings to provide lift.

Crucially, when perturbed from outside, this design does not crash to the floor. It needs no fancy controls to stop it tipping over. At the moment, for simplicity, it is powered through a wire that tethers it down. But it would be easy to fit it with a



small battery and let it go.

Dr Ristroph and Dr Childress, then, seem to have solved an important problem in ornithopter design. And in doing so they have also shown that evolution, though clever, is not always as clever as human engineers—for as far as is known nature has neither now, nor at any time in the past, come up with the equivalent of aerial jellyfish. ■

Just the ticket

Smart labels: The 40-year-old barcode has a new, more intelligent rival that can store information, display and transmit it

IN JUNE 1974 history was made at a supermarket in Troy, Ohio, with a ten-pack of Wrigley's Juicy Fruit chewing gum. It was the first time a commercial item bearing a Universal Product Code (UPC) was scanned by a cashier at the checkout. Forty years on, what became known as a barcode has transformed the world of commerce by providing reliable product identification, tracking and pricing. Nearly everything now comes with a barcode.

As revolutionary as it was, the barcode has limited abilities. It can impart only the information it was printed with, represented by a series of horizontal stripes or a matrix pattern that can be read by an optical device, like a laser. The next generation of labelling will be more adept, containing tiny printable electronics able to generate, store and share information. These smart labels are about to become a big part of "the internet of things".

Some products already have small electronic devices, such as a radio-fre-

quency identification (RFID) tag, attached to them. Unlike a barcode, an RFID tag does not have to be in sight of the device that reads it. They are used as security tags, to track products in a factory and they are implanted into pets for identification. Most are passive, emitting only an identifying signal, such as their UPC, in response to a radio transmission. An RFID tag, though, remains relatively expensive compared with a barcode, which can be printed as part of the design on packaging.

The idea behind smart labels is to produce a flexible film of electronics that can be printed like a barcode. One company commercialising this is ThinFilm, based in Oslo. It has pioneered a way to print memory circuits which can be used by smart labels to store information.

The ThinFilm memory is printed as a film of ferroelectric polymer sandwiched between two electrodes. When a voltage is applied to the top or bottom electrode, the polymer's magnetic polarisation can be switched. When the voltage is removed, it remains in the same state. This means it can be read as a one or a zero.

The amount of printable memory that can be produced is not huge. But for some applications a little can go a long way. As ThinFilm points out, a tiny 20-bit memory label can store over 1m combinations, which is enough for companies using them in things like toys or loyalty cards.

The next thing is to add logic, which requires printing transistors. For this, ThinFilm has teamed up with PARC, a Californian subsidiary of Xerox now run as an independent research laboratory. PARC has been working on printing flexible electronics for more than a decade.

PARC develops inks with the properties of the components it wants to print, such as a semiconducting material for transistors. Silicon is used to make transistors, but being difficult to dissolve does not make a good ink. So PARC uses organic materials instead. These can be printed with inkjet machines or, as ThinFilm does, with commercial reel-to-reel presses.

In January ThinFilm bought Kovio Technology, a Silicon Valley firm with expertise in Near Field Communication (NFC). This is a system which allows a user simply to tap an NFC tag with a portable device, like a smartphone, to send or receive data. NFC is a more sophisticated version of RFID and is already used by some contactless payment systems. By incorporating NFC, smart labels will be able to communicate wirelessly.

Besides conveying product codes, the applications which the company already has in mind include recording storage times and temperatures for perishable goods like food and pharmaceuticals. These data can be displayed on a flexible screen along with other consumer information. Smart labels might even be pro-

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Chilling out

►grammed to automatically discount their prices in response to marketing campaigns. Confirming the identity of products is another potential use. Davor Sutija, Thinfilm's chief executive, thinks smart labels can be printed for less than the cost of holograms, which are currently used to authenticate some goods.

To gain widespread use, smart labels will need to be cheap. Basic printed-memory labels could be produced for around two cents, reckons Dr Sutija. Printed sensor-labels might cost 50 cents or less, compared with \$10 or more for a system using conventional microelectronics. Prices would be bound to come down if smart labels become anywhere near as popular as barcodes. That would open up all sorts of possibilities. Imagine a label that would inform a smartphone app that you have put on the wrong trousers. ■

It's the alcohol talking

Molecular communications: Researchers are looking at ways to broadcast messages using chemical rather than electrical signals

HUMANS have long experimented with how best to communicate at a distance. Smoke signals and drums date back to prehistoric times. The Romans used carrier pigeons as messengers to support their conquests. Since the early 1830s, however, communication has been dominated by electrical or electromagnetic signals, from the first telegraph to the carrier waves in fibre-optic cables and the wireless networks of cellular telephones. But now a new contender is signalling its presence: molecular communication.

Modern telecoms has limitations. In

seawater, or inside oil or sewer pipelines, for instance, wireless communications are sluggish, inefficient and often too unreliable. When buildings collapse, the mix of concrete and steel debris, dust, smoke and water often renders radio useless for those who are involved in search and rescue operations. And in a world of increasingly nanoscale devices, electromagnetic communication is hampered by factors such as power consumption and the need for an antenna to transmit the signal.

An alternative solution that some researchers are looking at is to use chemical signals to carry information. Such molecular communication is widespread in nature: embryo and uterus cells communicate with each other in this way, for example, and insects and animals use it to send messages to both friends and foes. When a dog urinates repeatedly on its daily walk, the chemical markers it leaves behind tell other dogs about its gender, health and reproductive status. How often and where it leaves its messages also says a lot about the dog's standing in the local canine hierarchy.

Building a functioning molecular-communications system that can send and receive data has proved tricky. But researchers at York University in Toronto and the University of Warwick in Britain have now done so using a battery-powered liquid sprayer, a desktop fan, a handful of breathalyser sensors, some cheap Arduino open-source electronics and an ample supply of rubbing alcohol. With this they managed to text the message "O Canada" (the title of Canada's national anthem) four metres across a room—a first for molecular communication.

To do so the system converts text into a binary sequence using an International Telegraph Alphabet standard in which characters are represented by five binary digits (bits). The electronics control the sprayer to transmit the binary sequence using "on-off keying": a single spray of alcoholic mist for a "1", and no spray for a "0". Specific bit sequences indicate the beginning and end of each message. The sensors detect increases or decreases in alcohol concentration in the air and convert that into digital data. And the fan? It helps waft the misty message across the room.

Andrew Eckford, one of the York University researchers, concedes that the set-up is not going to be streaming Netflix any time soon. After some experimentation, the optimal transmission rate for the system turned out to be one bit every three seconds, according to the results published in *Public Library of Science* by Dr Eckford and his colleagues Nariman Farsad, also of York University, and Weisi Guo, of the University of Warwick. That

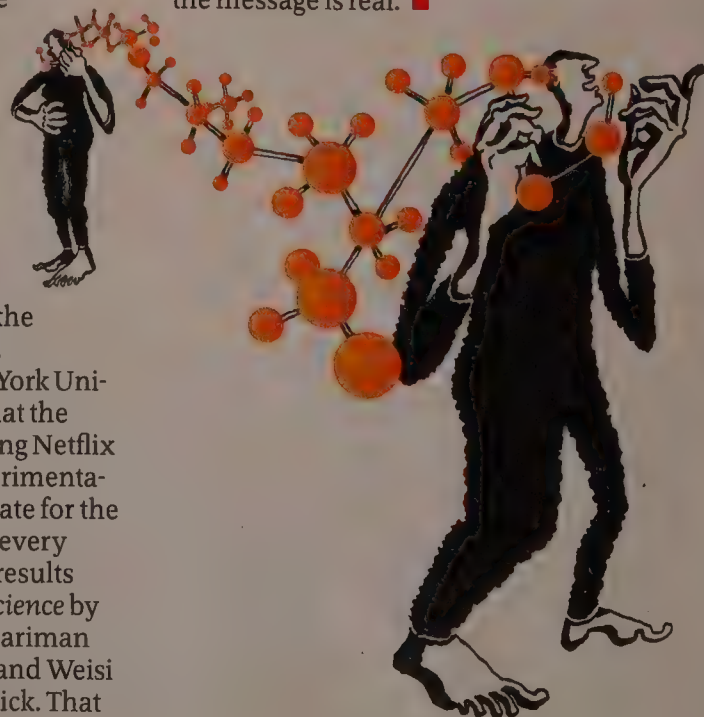
means sending "O Canada" took a somewhat leisurely two minutes to transmit. But it is a start.

Different methods of encoding the data, varying spray durations and using more sophisticated equipment would, the researchers think, increase both speed and reliability. With such fine-tuning, Dr Eckford thinks that kilobits per second is not an unreasonable goal. And if messages can one day be encoded in the molecules themselves, then bandwidth and speed would increase exponentially.

But speed is not necessarily the point. One potential use of the technology is for swarms of tiny search-and-rescue robots unleashed into a collapsed building to leave each other short molecular messages. Dr Eckford says such "chemical graffiti" could be used to describe which areas have been searched and what has been found. It might even be possible to send simple images to the surface, along with basic information about where rescuers should concentrate their efforts.

Stephen Bush, a senior scientist at GE Global Research in Niskayuna, New York, and the author of a book on nanoscale communication networks, is also enthusiastic about the technology's potential. The advantage of molecular messaging over other sorts of communication, he says, is its ability to be deployed in hard-to-reach places, such as providing in-body communications for medical applications.

The body's cellular signalling pathways have already been mapped, so these could serve as "communications channels", says Dr Bush. Digital signals could be sent, say, to the vagal system to help moderate a patient's blood pressure or heart rate. Data transmitted molecularly might also enable blood-sugar levels to be monitored without invasive pinpricks. This may be a long way off, but a shoe-string experiment in Toronto has shown the message is real. ■



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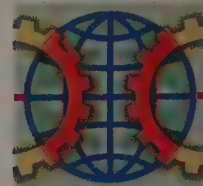
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Stalking trolls



Intellectual property: After being blamed for stymying innovation in America, vague and overly broad patents on software and business processes could get the chop

AT LAST, it seems, something is to be done about the dysfunctional way America's patent system operates. Two recent developments suggest calls for patent reform are finally being heard at the highest levels. First, in 2013, defying expectations, the House of Representatives passed (by an overwhelming majority) the Innovation Act, a bill aimed squarely at neutralising so-called patent trolls. These are individuals or companies who buy up lots of patents and then use them to extract payments from unsuspecting victims. Second, the US Supreme Court agreed to rule on what is the most contentious issue of all: which inventions are actually eligible for patent protection.

Frivolous lawsuits filed by trolls cost American companies \$29 billion in 2011 alone. Trolls (known in the legal world as "patent assertion entities" or "non-practising entities") do not make anything, but send out thousands of "demand letters" to companies that allegedly infringe what are often vague and overly broad business-process and software patents. In recent years their targets have spread from high-tech firms to universities, retailers, hospitals, charities and even consumers. The trolls demand a settlement fee, which many of the victims pay rather than face the punitive cost of litigation—\$2m or more these days.

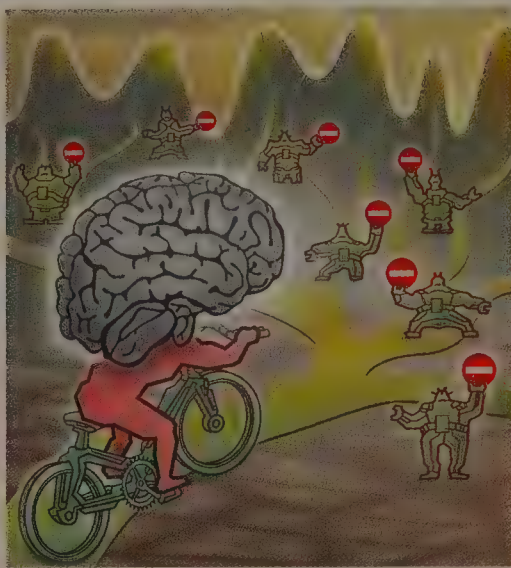
Concern that the flood of frivolous patent suits in America is hobbling innovation and competition has caught Congress's attention. Startups threatened by such actions frequently have to withdraw from the business or go bust. Bigger companies that choose to fight spend tens of millions of dollars on litigation that could otherwise go on research and development.

In a sense, the legal bullying by trolls is a symptom of a wider complaint: the poor quality of many patents granted by the US Patent and Trademark Office (USPTO) in the past decade—especially those covering computer software and business transactions (themselves often based on software algorithms). One such patent covers simply upgrading computer software over the internet. That is admittedly useful, but hardly novel or non-obvious—the three fundamental requirements for eligibility adopted by patent jurisdictions everywhere.

Numerous corporations have started using their portfolios of poorly defined software patents to prevent rivals from entering the market. Witness the series of lengthy legal disputes between Apple and Samsung. Too often, it seems, software patents operate not as an incentive for innovation, but as a barrier to entry and a tax on new-product development. This is not what patent law was intended to do. Although the USPTO has been mainly at fault, America's courts have not helped.

One of the worst offenders has been the US Court of Appeals for the Federal Circuit, the appellate court that rules on patent disputes, among countless other things. Unlike its specialised counterparts in Europe and Japan, the Federal Circuit, with its grab-bag remit, has never acquired expertise in patent jurisprudence. As a consequence, it has issued some bizarre software rulings.

A cornerstone of any patent system is that laws of nature, natu-



ral phenomena and abstract ideas cannot be patented. Were that not the case, all manner of monopolies could spring up based on common ideas—such as boiling water to make tea—that could feasibly be used to prevent others from doing the same, or at least require them to pay a licence fee. Historically, the courts have viewed software inventions as far too abstract to qualify for a patent.

That changed in 1998, when the Federal Circuit found that a business method (in an action known as the *State Street Bank* case) that "produced useful, concrete and tangible results" was eligible for patent protection. A flood of equally dubious patents quickly followed.

A decade later, in the *Bilski* case, the Supreme Court revisited the issue of whether a method for doing business could be patented. It found the "invention" (a way of hedging commodity risks) too abstract to be patentable, but failed to provide a clear test of what constituted an abstract idea for judges in lower courts to apply.

In a much-watched patent dispute dating back to 2007 between Alice Corporation and CLS Bank, involving a way to avoid settlement risks when closing financial transactions, a lower court found the idea too abstract to be patented. But on appeal, two federal judges disagreed, arguing that implementing the invention on a computer rendered it non-abstract—and thus patentable.

A ten-member panel of the Federal Circuit subsequently agreed to rehear the case. Unfortunately, their opinion, issued in May 2013, has left the situation more confusing than ever. Between them, the ten judges issued no fewer than seven different opinions. A majority agreed that the patent in question was ineligible. But one dissenter on the panel, Judge Kimberley Moore, warned that if the patent were ruled invalid, it would cause the death of hundreds of thousands of similar patents for business methods, financial systems and software, and would "decimate the electronics and software industries".

A new ruling

As the Supreme Court now intends to review *Alice v CLS Bank*, it will finally confront the most fundamental of issues in patent law today: whether or not software patents are impermissibly abstract. A ruling is expected by July 2014.

Would it matter if software patents were judged too abstract to warrant patent protection? Despite Judge Moore's misgivings, patent issuance is a poor measure of innovation. Patenting is strictly a metric of invention. Innovation is such a vastly different endeavour—in terms of investment, time and the human resources required—as to be virtually unrelated to invention.

Indeed, many innovators have argued that the electronics and software industries would flourish if companies trying to bring new technology (software innovations included) to market did not have to worry about being sued for infringing thousands of absurd patents at every turn. A perfectly adequate means of protecting and rewarding software developers for their ingenuity has existed for over 300 years. It is called copyright. ■



When silicon leaves the valley

Semiconductors: As it becomes harder to cram more transistors onto a slice of silicon, alternative ways of making chips are being sought

THE computer industry is built on sand. For sand contains silicon, and silicon is an excellent material for building transistors, the tiny electrical switches used in a microprocessor chip. It is the ability to constantly shrink those transistors that has driven the industry. The components in Intel's 4004, the first microprocessor, were 10,000 nanometres wide, about a tenth as wide as a human hair. The features in the company's latest products, after decades of shrinkage, are just 22 nanometres across—about as wide as 50 of the silicon atoms from which they are made.

The obsession with size arises from the almost magical results of shrinking a transistor. More transistors mean more capable hardware. Smaller transistors switch on and off more quickly, so can carry out calculations faster. And they use less electricity. The result has been an explosion in computer power that has been one of the defining features of the past 50 years.

The rate of shrinkage has followed Moore's law, an observation made in 1965 by Gordon Moore, one of Intel's founders, that the number of transistors that can be

crammed into a given area doubles every couple of years. One way to view that is to examine the cost of transistors. In 1982, when Intel launched its 80386 chip, \$1 bought several thousand transistors. By 2002, you could get 2.6m for the same price. By 2012, when chips routinely sported more than a billion transistors, the price had fallen to 20m to the dollar.

But the old magic is no longer working as well. This year something unprecedented may happen: the Linley Group, a Silicon Valley consultancy, reckons the price of cutting-edge transistors will rise—to 19m per dollar. Modern transistors are so tiny that shrinking them still further is becoming difficult and expensive. Nor are the benefits so great. Transistors' tininess is beginning to turn against them, making chips misbehave and limiting how much extra performance can be wrung from them.

That does not mean that Moore's law is coming to an end, at least not yet. But no exponential trend can carry on for ever, and some think the end of the silicon transistor may now be in sight. "Silicon will probably go down by another three or four [shrink-

age steps]," says Supratik Guha, director of physical sciences at IBM's Thomas J. Watson research laboratory. "After that, though, it's going to hit a wall."

Engineers have lots of ideas about how to build future transistors, and new research papers come out regularly. Many look at redesigning the transistor itself and changing the materials it is built from to keep shrinking them. And when that proves no longer possible, there are new, exotic approaches to computing that may ride to the rescue.

The quick switch

Chipmakers are struggling with both physics and economics. Start with the physics. For all their usefulness, transistors are simple devices. Current flows from a "source", through a "channel" and into a "drain". Applying a separate voltage to a "gate" allows that flow to be switched on or off, providing the basic building-blocks of computing. As transistors shrink towards atomic dimensions, the gate's control over the channel gets weaker. Modern transistors leak, with current flowing even when the device is meant to be switched off. That wastes power and generates heat, which must be disposed of somehow.

One way to get around the problem is to build upwards. In 2012 Intel introduced chips with upright transistors, in which the channel rises from the rest of the circuit, like a tall building above a cityscape. The gate is then wrapped around the channel's three exposed sides, making it better able to impose its will. Other manufacturers have similar plans, although they have found it harder to master the technology. Taiwan Semiconductor Manufacturing Corporation, the world's biggest chipmaker, will not have its version ready until 2015.

As these finned transistors shrink they will suffer leakage problems too. The next logical step, says Mike Mayberry, Intel's vice-president of component research, is to surround the channel on all four sides, encasing it entirely within the gate. These "gate-all-around" transistors take the form of tiny, vertically stacked wires, with the gate threaded across the wire rather like a bead on a necklace. They have been built in laboratories, but will be difficult to mass produce. A related idea is to stack transistors on top of one another to form three-dimensional chips without actually shrinking the transistors themselves. It would help keep Moore's law chugging along, but will exacerbate the heat problem.

Besides redesigning the transistor, another option is to use new materials, like ►►

In the future it might even be possible to build a computer without devices that resemble the traditional transistor

► so-called III-V elements, which are closely related to silicon. Some of these can conduct current through a transistor more efficiently than silicon, which would allow lower voltages, cutting power consumption and extending battery life. “The general consensus is you can expect a performance increase of between 20 and 50%,” says Richard Hill of Sematech, a chip-industry research consortium.

Carbon is a favourite among many researchers, either in the form of tiny rolled-up “nanotubes” or flat, atom-thick sheets known as graphene. Like the III-V materials, electrons can flow through carbon with great ease. But carbon has significant downsides, too. The electrical properties of nanotubes depend crucially on their diameter, which means manufacturing must be flawless. Graphene is, in some ways, worse: in its natural state, the material lacks a “bandgap”, which means that its conductivity cannot be switched off—a showstopping problem in a transistor. Several research groups are investigating ways to create a bandgap in graphene, says Dr Hill. But he thinks that flat sheets of other materials such as molybdenum sulphide—which sport a bandgap intrinsically—may prove better candidates for future generations of ultra-small devices.

But it is a long road from the lab to the fab, as the factories which make chips on large discs of silicon (pictured below) are known. And just because a device is physically plausible does not mean it makes economic sense to put them into production. New technologies are likely to be integrated slowly, with hybrid chips featuring both standard silicon transistors and exotic new devices, expects Mr Mayberry.

Even a gradual approach will push prices up. Modern fabs are already eye-wateringly expensive: Intel recently cancelled one with costs rumoured to have topped \$5 billion. If raw speed is vital, a customer might be willing to pay more for exotic, high-speed chips, says Linley Gwennap, who runs the Linley Group. But for many products, like midrange smartphones, that will not make sense. All the big chipmakers intend to keep shrinking their circuits until at least 2020 or so, but if that is at the expense of rapidly rising production costs, then economics could bring the curtain

down on Moore’s law before physics does.

Even if that does happen, it need not be the end of faster computers. “Fifty years of Moore’s law has made the industry fat, dumb and happy,” says Dr Gwennap. Decades of ever-faster hardware have diverted firms from trying to squeeze performance increases out of software and clever programming. It may also be possible to use existing transistors more efficiently. Many modern chips are generalists; competent at any task but excelling at nothing. Specialist hardware, designed to do a small number of tasks well, could offer significant speed-ups. This approach is already employed in supercomputers, which use chips originally designed for the fast-action graphics used by video games.

And then it gets fuzzy

In the future it might even be possible to build a computer without devices that resemble the traditional transistor. The best known approach is quantum computing, which harnesses the fuzzy nature of quantum mechanics to perform rapid computational work. But the hype far exceeds the reality, at least for now (see earlier story). Building a quantum-mechanical replacement for a traditional computer is very difficult. And even then their speed advantage is heavily restricted. They are known to be faster than ordinary computers at only a few (admittedly quite useful) tasks, such as searching unsorted information, or finding the prime factors of colossal numbers. For other jobs, they may offer no advantages.

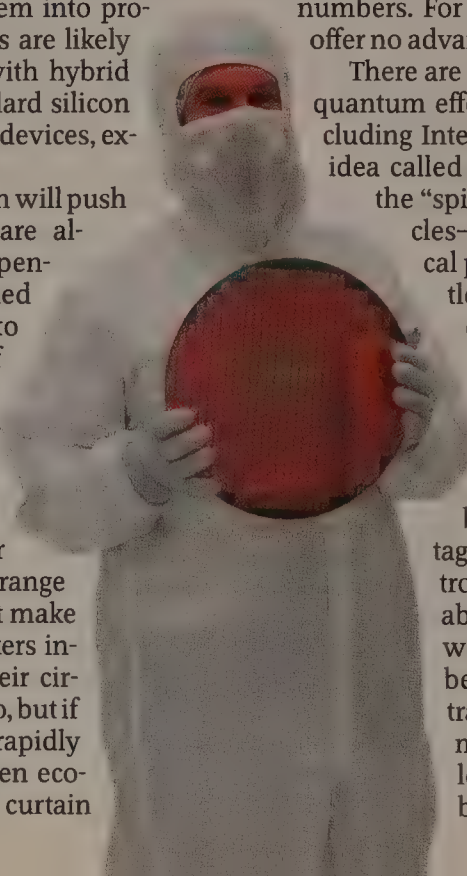
There are other ways to harness quantum effects. Several firms, including Intel, are investigating an idea called spintronics, in which the “spin” of subatomic particles—a quantum-mechanical property that bears little relation to the classical notion of spin—is used to perform computation. Spintronics offers much lower power consumption, and brings other advantages too. Some spintronic devices may be able to do more logical work with a given number of components than traditional chips can manage. That could allow machines to be built from fewer de-

vices. A typical adder, one subcomponent of a modern chip, is built from around 30 separate transistors, says Intel’s Dr Mayberry. A spintronic one could be built from just five, allowing more computational power to be packed into a given area.

The most ambitious idea goes by the general name of “neuromorphic computing”. First proposed by Carver Mead, a computer scientist, in the 1980s, it looks to biology for inspiration. Biological brains are different from silicon computers in fundamental ways, says Dr Guha at IBM. Computers are electronic devices, whereas brains rely on a mixture of electricity and chemistry. The fundamental information-processing unit of the brain, the neuron, can be connected to thousands of other neurons, whereas a typical transistor connects to just a handful of peers. A transistor may switch on and off billions of times a second; neurons fire around a million times slower. Neurons can make or break connections on the fly, allowing brains to adapt themselves to a task, while the wiring of most silicon chips is fixed.

Biological brains are not a patch on traditional computers when it comes to raw number-crunching. But they excel at other useful tasks such as pattern recognition. And compared with modern computers, they are stunningly power-efficient, adds Dr Guha. A good comparison is IBM’s own Watson computer, which famously beat all human challengers at Jeopardy!, an American word-game, in 2011. Watson was built from 90 highly specified computers, lived in a special air-conditioned room and consumed dozens of kilowatts of power. By contrast, the brain of Ken Jennings, one of the human players that the machine defeated, weighs a few pounds and draws about 20 watts of power, all of which is provided by cornflakes and sandwiches.

The problem with learning from Mother Nature is that humans do not yet understand her subtleties. Despite decades of research, no one really knows how the brain works, and that makes it hard to apply its magic to technology. But supporters of neuromorphic computing may receive help from other quarters. Brain science is a hot topic with plenty of research money sloshing around. Two big new projects, Europe’s €1 billion (\$1.4 billion) Human Brain Project, and America’s similar SYNAPSE initiative, promise even more. And if such projects come to fruition, then today’s marvellous, intricate masterpieces in silicon may one day look as clunky and primitive as the hand-cranked mechanical calculators they replaced. ■



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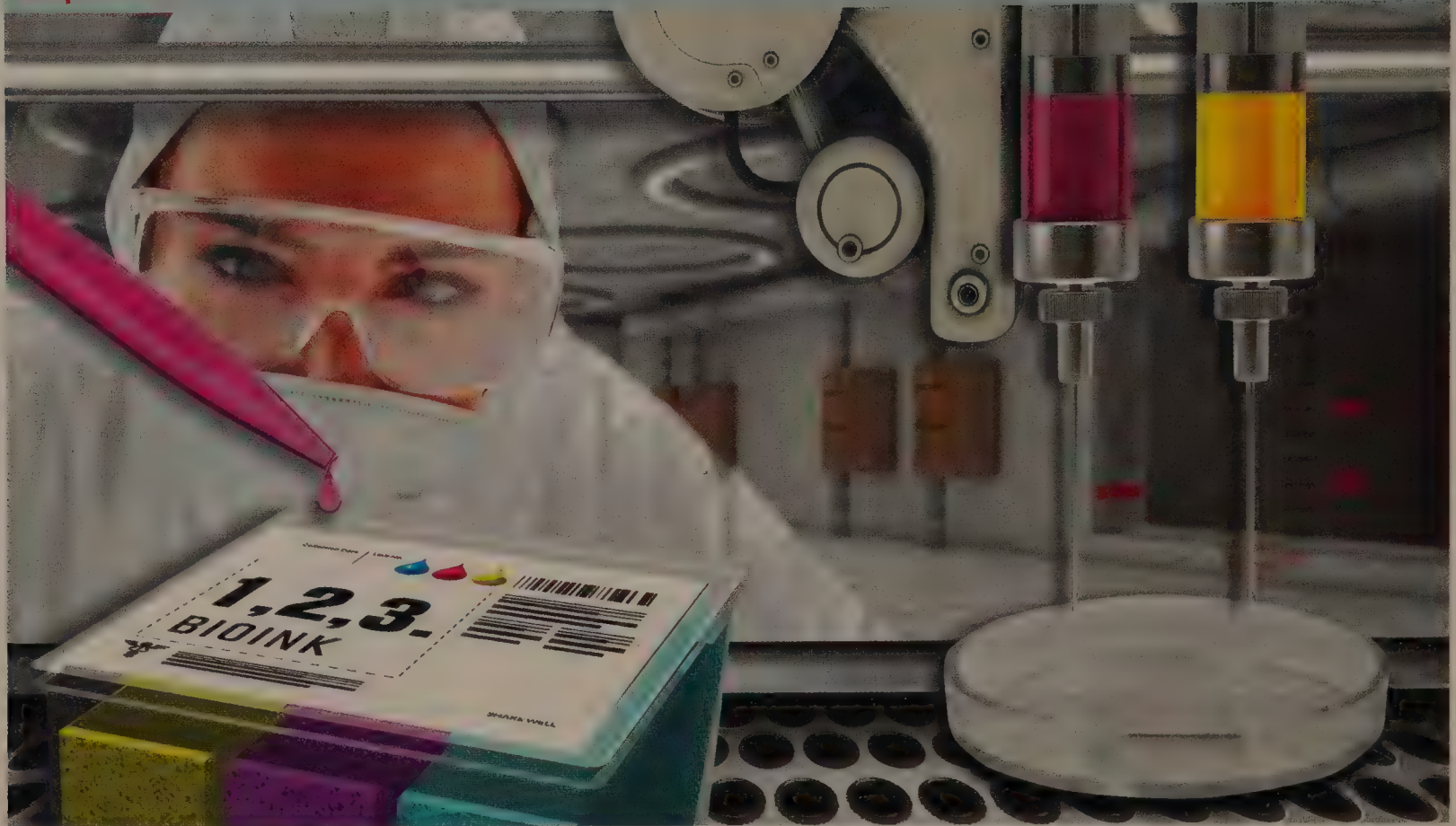
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Printing a bit of me

Bioprinting: Building living tissue with a 3D printer is becoming a new business, but making whole organs for transplant remains elusive

IN A state-of-the-art clean room, a scientist clad in a full-body containment suit, a hair net and blue gloves is preparing some printing cartridges—filled not with ink but a viscous milky liquid. Next to her sits a computer connected to a machine that resembles a large ice-cream dispenser, except that each of its two nozzles is made of a syringe with a long needle. Once the scientist clicks on the “run program” button, the needles extrude not a vanilla or chocolate-flavoured treat, but a paste of living cells. These bioinks are deposited in precise layers on top of each other and interspersed with a gel that forms a temporary mould around the cells.

Forty minutes later, the task is finished. Depending on the choice of bioink and printing pattern, the result could have been any number of three-dimensional biological structures. In this case, it is a strand of living lung tissue about 4cm in length and containing about 50m cells.

Since its inception in 2007, researchers at San Diego-based Organovo have experimented with printing a wide variety of tissues, including bits of lung, kidney and heart muscle. Now the world's first public-

ly traded 3D bioprinting company is gearing up for production. In January samples of its first product—slivers of human liver tissue—were delivered to an outside laboratory for testing. These are printed in sets of 24 and take about 30 minutes to produce, says Keith Murphy, the firm's chief executive. Later this year Organovo aims to begin commercial sales.

Each set consists of a plate with 24 wells containing a piece of liver tissue 3mm square and 0.5mm deep. Although prices have not been fixed, a set of tissues like this can sell for \$2,000 or more for laboratory use. It might seem expensive, but it could save pharmaceutical companies a lot of money. This is because Organovo's research indicates that the slivers of liver respond to drugs in many ways like a fully grown human liver would. If this is confirmed by outside testing, researchers could use the printed tissues to test the toxicity of new drugs before deciding whether to embark on expensive clinical trials with patients.

The invention of 3D printing in the 1980s provided a technology now used to manufacture everything from aircraft parts

to prosthetic limbs. But the promise of 3D bioprinting is even larger: to create human tissues—layer by layer—for research, drug development and testing, and ultimately as replacement organs, such as a kidney or pancreas, for patients desperately in need of a transplant. Bioprinted organs could be made from patients' own cells and thus would not be rejected by their immune systems. They could also be manufactured on demand.

At present only a handful of companies are trying to commercialise the production of bioprinted tissues. But Thomas Boland, an early pioneer in the field, says that plenty of others are interested and estimates that about 80 teams at research institutions around the world are now trying to print small pieces of tissues as varied as skin, cartilage, blood vessels, liver, lung and heart. “It's a wonderful technology to build three-dimensional biological structures,” says Gabor Forgacs, who co-founded Organovo in 2007 and was the company's scientific mastermind.

Don't hold your breath

Despite all this interest, the age of organ printing is not just around the corner. Not surprisingly, printing with living cells to create tissues is much more complex than printing objects in plastic or metal. Printing whole organs made from human cells was Dr Forgacs's original idea when he started Organovo, but it has proved elusive. Yet he and other tissue engineers are hopeful that it will, one day, be possible.

Dr Boland started experimenting in the summer of 2000 using an old Lexmark ink-jet printer that was sitting in his former lab

Organ and tissue structures vary in complexity, and some are much harder to make than others

at Clemson University in South Carolina. (He is now director of biomedical engineering at the University of Texas at El Paso.) At the time he wasn't looking to print 3D biological structures, just proteins or cells in two-dimensional patterns. As it turned out, typical inkjet nozzles then were just large enough to accommodate most human cells, which tend to be around 25 microns in diameter (a micron is a millionth of a metre). "The printers at the time were really fulfilling all of the requirements that we would use for cell printing," says Dr Boland.

Building additively

The potential of the technology quickly became apparent to other scientists. By the early 2000s, several research teams from different laboratories had begun to develop or modify printers to print cells in three dimensions. In Dr Boland's case, he simply added to an HP printer a platform that could move up and down. In 2003 he filed for his first cell-printing patent and collaborated with Dr Forgacs and three other colleagues on a paper for *Trends in Biotechnology* in which they predicted that in this century "cell and organ printers will be as broadly used as biomedical research tools as was the electron microscope in the 20th century." And in September 2004 the University of Manchester in Britain hosted the First International Workshop on Bioprinting and Biopatterning, with 22 speakers from ten countries.

Around the same time, Dr Forgacs began developing the technology that became the basis for Organovo. He devised a technique that could print a large number

of cells at one time. Instead of an inkjet's tiny nozzle that allows only droplets with individual cells to squeeze through, Dr Forgacs invented an extrusion-based printing process that uses a syringe with a needle or micropipette with an orifice that may be as large as several hundred microns. That made it possible to deposit large cell aggregates, in spheroid or cylindrical form. Pressure was applied to push them out, typically using an automated plunger.

Bioprinting is very different to standard tissue-engineering, in which cells are cultured and then seeded onto individual biodegradable moulds or scaffolds whose shapes resemble that of the organ or tissue they are replacing. Depending on the architectural needs of the organ and its function, a scaffold's properties and structure need to vary as well, says Anthony Atala, a leader in this field and director of the Wake Forest Institute for Regenerative Medicine in North Carolina.

In the case of a blood vessel, the scaffold would have to be thin and elastic. "The scaffold really is acting like a prosthesis, like a device, until the cells are able to take over and lay down their own matrix," Dr Atala explains. The timing of the scaffold's demise is critical, he adds. If it degrades too quickly, the transplant is going to fail. But if it degrades too late, after the cells have made their own structure, the patient may end up with scarring.

Dr Atala and his team used to create scaffolds by hand and seeded the cells with a hand-held pipette. 3D printing helped to scale up the process, automate it and make it more precise because the printers run under computer control. His

institute now has half-a-dozen 3D printers at its disposal, and in most cases researchers print the scaffold and the cells together. That way, says Dr Atala, "we could not just create one organ at a time, but create many organs at the same time."

Organ and tissue structures vary in complexity, and some are much harder to make than others. From an architectural standpoint, flat structures, like skin or cartilage, are less complex than tubular ones, such as blood vessels or windpipes, says Dr Atala. Hollow, non-tubular organs, like the bladder, stomach or uterus, are trickier. But the most complex are relatively solid organs, such as the heart, liver or kidneys, which consist of many more cells and an extensive vascular structure.

Transplanted parts

So far, surgeons have been able to implant a variety of engineered flat, tubular and hollow tissues into patients, including skin, cartilage and muscle. Dr Atala has also successfully implanted lab-grown bladders and urethras into young patients. But solid organs are another matter. "That", he says, "is really the next frontier."

All tissue engineers have the same goal—to create human organs for transplant—but their approaches differ. In particular, they are divided on how much of a support structure or scaffold they need to provide for the cells, and what building materials are the most suitable.

Dr Forgacs believes that any type of scaffold interferes with a cell's natural biology. His approach relies on the cells' intrinsic ability to develop an innate shape and structure, which is akin to the differentiation and developmental processes that occur inside an embryo. Instead of a scaffold he uses what he calls "biopaper", a water-based gel that is printed along with the bioink and surrounds the cell aggregates. Dr Forgacs calls this process "scaffold-free" bioprinting. The gel is not going to be part of the biological tissue, but a structure that holds the printed material together until the cell clusters themselves begin to fuse.

Because gels could interact with the cells, it is best to remove them quickly, usually in less than 24 hours, concurs Mr Murphy. "Our goal is to make something that's 100% tissue as quickly as possible," he says. In the case of Organovo, scientists do it by formulating the gel so they can dissolve it chemically or physically peel it off.

Brian Derby of the University of Manchester and author of a review in *Science* on printing tissues and scaffolds, emphasises that in some cases it is beneficial to

Print me baby, one more time

How bioprinting works

1. Stem cells, or cells taken from a biopsy of a patient, are put into a growth medium to multiply and are used to form a bioink made of cell aggregates.

2. The bioink is loaded into cartridges that consist of a syringe fitted with a long extrusion nozzle for printing.

3. Software drives the bioprinter to deposit a pattern of cell aggregates in precise layers, one on top of the other, and interspersed with layers of a water-based substance called a hydrogel, which is deposited by a separate nozzle and functions as a temporary mould around the cells.

4. The printed tissue is left to grow and mature and the hydrogel removed.

5. The printed tissue can then be used in medical research or as a transplant material.

► use a scaffold. "People use scaffolds for a reason," he says, "and that's because gels have little or no structural integrity." Rigid tissues, such as bone, require a structure that provides mechanical strength while the cells lay down their own matrix.

One of the biggest challenges facing tissue engineers is creating the necessary blood flow and vascular structure to supply organs with nutrients and oxygen, so they can thrive and survive in the long term. The heart and other solid organs in particular require an entire vascular tree, which is comprised of large blood vessels that branch into smaller and smaller vessels. So far, researchers have been able to make simple blood-vessel structures but not more complex vasculatures that could nourish solid organs.

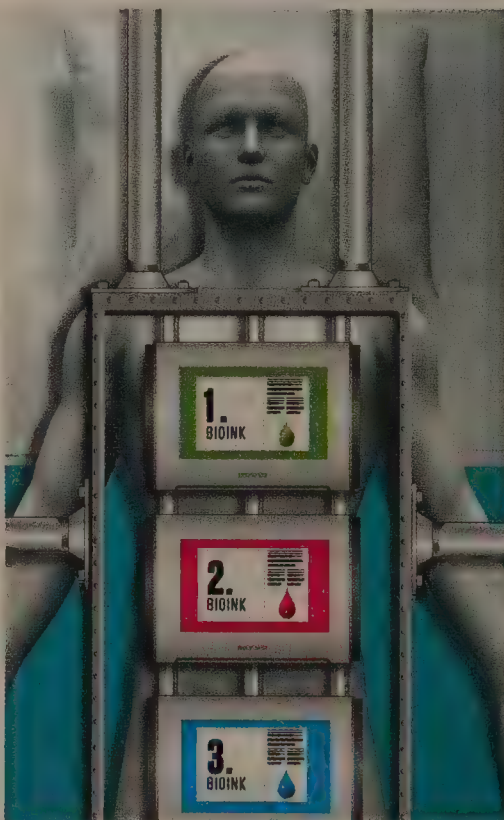
Bioprinters could potentially construct a series of channels into each layer of cells, and these channels might be used to supply blood to tissue, says Dr Boland, who is working on the problem. His approach is to create hollow tubes from fibrin, a protein involved in blood clotting, surrounded by fat cells. On their inside, the tubes entrap endothelial cells, a type of cell that naturally forms blood vessels. The tubes serve as scaffolds for the cells, which—after being printed—go through a growing phase in an incubator. The structure is then implanted in mice and, if all goes well, connects up and integrates with surrounding tissues. If this approach works out, it could also prove useful for Dr Boland's company, TeVido BioDevices, which aims to develop custom bioprinted implants and grafts for breast-cancer patients made from their own fat cells.

Organovo is licensing Dr Boland's original cell-printing patent and has incorporated inkjet technology into its current systems (though the company will not disclose whether it plans to use it to help manufacture liver tissues). While Dr Forgacs's extrusion process creates larger cell structures very quickly, one important feature of the inkjet-printing approach is its high resolution. It can be used to add detail and to apply thin layers of cells and patterns within layers, says Mr Murphy.

Several laboratories are currently working on developing bioprinters that could print skin cells directly onto wounds and burn injuries. At Wake Forest, researchers use a printer in conjunction with a laser to scan the size and depth of an injury. It produces a topological 3D map of the wound, which is used to determine how much material to deposit at any one spot, explains John Jackson, a member of Wake Forest's

skin-printing team.

Although the majority of bioprinters at Wake Forest are inkjet based, the researchers opted for a pressurised version. This is because of the difficulty of getting cells through the inkjet nozzle. "You get a lot of clogs," says Dr Jackson. With the system they have chosen the researchers can change nozzle sizes, and the machine can print up to eight different types of cell. Recent studies on animals have shown that it is successful in printing precise layers of cells and cell types onto wounds. The process takes about 20-30 minutes for a wound that is around 10cm in length and width and up to 1cm deep.



The current treatment for burn patients is to take skin grafts from other areas of their body and transplant them onto the wounds. But the supply of skin from the body is limited, and the graft has to be prepared for transplantation. So, asks Dr Atala, why not save a step and print skin cells directly onto the patient? "The patient itself is the best incubator," he believes. This process might also work for people with diabetes and for the elderly, whose wounds often do not heal well. Dr Jackson hopes, if things go according to plan, that the skin printer could be used in clinical trials within three or four years.

Dr Forgacs's latest project does not involve bioprinting for medical purposes, but a simplified printing process to create

meat for people to eat. When Organovo went public in 2012, he decided to leave the board (though he is still a consultant for the company) and devote more time to being chief scientific officer of Modern Meadow, a startup which he co-founded in 2011. As producing biomaterials for human consumption will probably involve lots of regulatory testing before any products can be brought to market, the company will initially concentrate on making leather (although not with a bioprinting process, but with some other form of biofabrication, says Dr Forgacs). Leather-goods manufacturers will be intrigued to see what he comes up with.

Dr Forgacs is hopeful that scientists will be able to build major organs eventually, although he does not believe they will ever be able to recreate a heart or kidney in the same minute detail as those organs exist inside the body. Instead he suggests researchers should look at building biological structures that function the same way. These will not look like the organs people have, he says, but they will be able to perform some of the same functions.

Mini organs

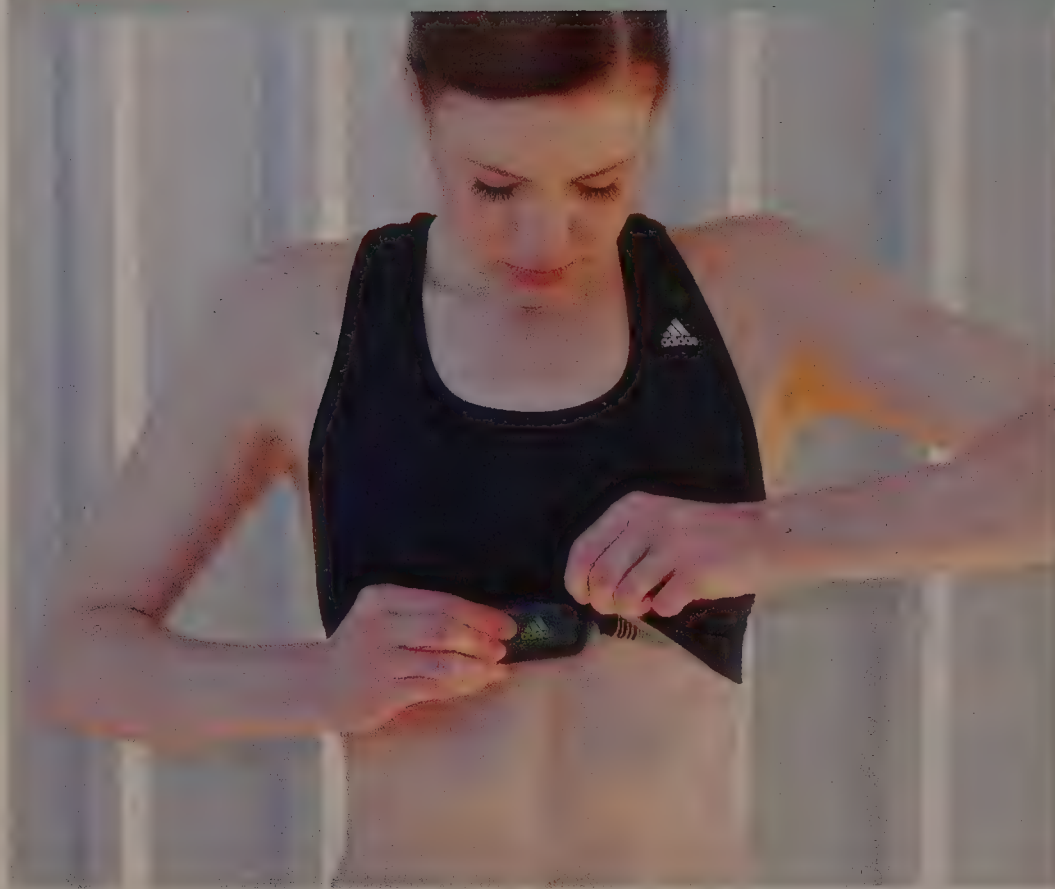
Organovo is conducting animal tests with structures that are not organs but smaller, patch-sized tissues that it can build. These structures could work like miniature organs and assist damaged tissue to function as normally as possible. For example, a heart-muscle patch could help repair the heart after a myocardial infarction. Or a patch could be used to bypass a blocked blood vessel. These are early-stage studies and no results have yet been disclosed. The company will evaluate a number of tissues which might be bioprinted as patches or mini organs, and then choose one or two with which it may proceed to clinical trials, possibly within the next five years, says Organovo's Mr Murphy.

Ibrahim Ozbolat from the University of Iowa co-wrote a review of bioprinting and organ fabrication last year. He believes miniature organs are an important step towards creating fully functional organs, as they may be able to perform the most vital functions, such as the secretion of insulin to help the pancreas regulate glucose levels. The mini organs or patches may not cure patients, but could improve their quality of life. "The good news is the field is growing tremendously," says Dr Boland. The arrival of the first products on the market will encourage more people to start working on bioprinting, and thus further breakthroughs. ■



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An uncommon thread

Conductive fibres: From lighter aircraft to electric knickers, flexible filaments raise a wide range of interesting possibilities

LAS VEGAS in January is the place to spot the latest trends in consumer electronics. The one that grabbed the attention of most people at the 2014 CES show were the wearables. These are gadgets that you put on, from all sorts of spectacles with built-in cameras and screens, like Google Glass, to wrist bands and watches that can monitor your heart rate or relay text messages. There is even jewellery that can warn you of too much exposure to the desert sun.

Fashionistas, however, were not impressed. These gizmos were far too clunky and geeky to be worn by anyone with dress sense, one columnist complained.

That is about to change. Developments in the use of conductive fibres mean fabric itself can now become an electronic device, allowing wearables to be incorporated into the most stylish clothing. And the fibres, being much lighter than metal wires, will enhance lots of other products, too.

Most conductive fibres are so flexible they do not crack or snap if repeatedly bent, unlike metal wires. This means they can be fed into a loom or embroidered directly onto cloth that can be worn and washed as normal. With costs falling and use increasing, the threads are a rapidly growing business, says Hugo Trux, head of

the Conductive Fibres Manufacturing Council (CFMC), an American trade group.

Using fibres that conduct electricity opens up all sorts of new design possibilities. For instance, Intelligent Textiles, a company in London, has worked with the British and Canadian armed forces to produce combat fatigues with pathways of conductive fibres to deliver power to the increasing amount of equipment which soldiers now wear for combat. The idea is to do away with the “Christmas-tree effect” of battle dress being swathed in cables and batteries, says Stan Swallow, a director of the company. Instead, power from a single battery-pack can be clipped to a belt or an armoured vest and channelled to any equipment the soldier is wearing.

Smart shirts

It is not just power leads that can be incorporated into fabrics, but electronic devices as well. Colin Cork and his colleagues at the Advanced Textiles Research Group at Nottingham Trent University in Britain have embroidered antennae onto shirts using silver-coated thread. In some cases, this is virtually impossible to see. The embroidered antennae can be used by devices worn by the user to transmit and re-

ceive radio signals or to boost the device’s own transmission range.

Some companies want to use the idea to conceal radio-frequency identification (RFID) tags in valuable fashion goods. This would be possible even in lightweight garments. A woven RFID tag could be read by a wireless reader (and, no doubt, eventually by a smartphone app too—which could lead to some embarrassment when someone scans your new Prada number and discovers it’s a knock-off).

Researchers have also used conductive yarn to embroider alphanumeric and musical keyboards into fabric. Touching a particular key dissipates an electrical charge which can be detected by an embedded processor. Often the idea is to use the electronics contained in the garment in tandem with a traditional clip-on device.

Adidas, a German producer of sportswear, has started knitting conductive fibres into stretchy garments to produce “textile electrodes”. These are only a few square centimetres in size and can pick up signals from the heart and other muscles. The data gathered by the electrodes are transmitted through the garment to a small gadget that is snapped into a shirt or sports top (as pictured opposite). This, in turn, passes them wirelessly to a user’s mobile phone for processing and display.

Textile electrodes are almost undetectable to the touch and do not need any sticky goop to make them work when next to the skin (although sweat does improve signal quality). The data can be transmitted directly by an athlete to his coach, or by a patient to a doctor, says Stacey Burr, head of wearable electronics for Adidas. Nor is the technology particularly expensive. In Germany, some of the company’s “sensor garments” sell for less than €60 (\$81).

Adidas is now designing workout tops that use elastic conductive fibres to measure the wearer’s breathing. A snap-in device feeds a small electric charge into a ring of conductive fibres that encircles the chest. Because the conductivity of the fibres decreases slightly upon stretching, the garment can calculate the quantity of air that has entered the lungs. Adidas will initially offer this to athletes who want detailed performance statistics, says Ms Burr. The system, known as RIP for respiratory inductive plethysmography, could be integrated with additional kit for medical use.

Plenty of other body-sensing clothing is being developed. At the Fraunhofer Institute in Berlin, researchers have come up with textile electrodes that measure the electrical activity of the large trapezius ►►

With a glance at their smartphone, wearers will see statistics on, among other things, their “Zen index”

muscle in the shoulder and neck. The system can distinguish between physical and psychological stress; the latter being identified by unnecessarily tightened shoulders. Such clothing could inform a wearer when it is best to pause during exercise. Attaching conventional electrodes to someone's body for the same purpose can itself cause them stress, says Torsten Linz, a member of the research team.

Researchers at Virginia Tech use conductive fabric to shuttle battery power and data to and from miniature gyroscopes and compasses fastened to shirt cuffs and other bits of clothing. The idea, says Tom Martin, a professor at the university, is to log and transmit an elderly patient's movements to a therapist or doctor. The computerised analysis is not yet perfect, admits Dr Martin. The system may, for example, determine that a patient brushed her teeth when in fact she brushed her hair.

Conductive fibres will have a broad “lifestyle” appeal, reckons Joanna Berzowska, head of electronic textiles at OMsignal, a Montreal startup. The company plans to start selling “smartwear that feels like everyday wear”. Its garments will use silver- and steel-blended yarns to report on muscle activity. With a glance at their smartphone, wearers will see statistics on, among other things, their “Zen index”.

Besides adding functionality to clothing, conductive fibres have huge potential as a weight-saving material. Every kilo removed from a typical airliner reduces its lifetime fuel cost by roughly \$2,200, reck-

ons the CFMC trade group. Aircraft could be made a lot lighter by replacing metal wiring—which for a big plane can amount to some 320km of cable and braided shielding, which prevents signal interference—with natural and synthetic fibres treated to conduct electricity.

One such fibre, a cottony yarn branded ARACON, is being used by Airbus, Boeing, Bombardier and Embraer in some of their aircraft. ARACON was developed by DuPont as an alternative to its Kevlar fibre, which is used in things ranging from bullet-proof vests to drum heads. Micro-Coax, a firm in Pennsylvania, makes ARACON by coating the synthetic fibres of Kevlar with copper, nickel and silver. The resulting yarn is not just lighter than metal wire, but also stronger and suppler, so it can follow more tortured pathways when wiring up complex machines like aircraft.

Into orbit

ARACON has been expensive to make, so its use was essentially limited to spacecraft, where losing a kilo cuts the cost of a launch by about \$25,000. However, the brisk orders and a \$2m investment in the manufacturing process are now bringing the price down. In the past year alone it fell by about half, says Ron Souders, Micro-Coax's technical expert.

The engineering potential of most conventional metal wire peaked a decade or two ago, says Al Abel, a former executive at Syscom Advanced Materials, a maker of conductive fibres in Columbus, Ohio, but

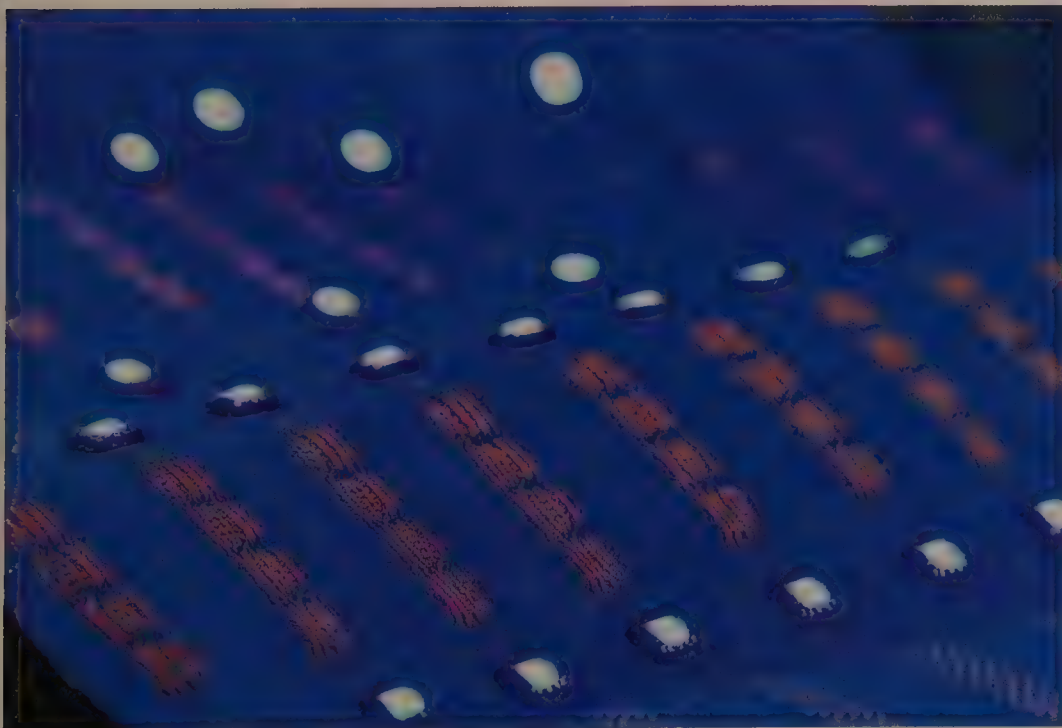
advances in conductive fibres are redefining how electrical wiring can be used. Eventually, even power-transmission lines could be replaced with aluminium- or copper-coated brawny synthetic fibres such as Zylon, which is already used to protect the cockpits of Formula 1 racing cars. Such fibres could make power lines a third or so lighter and at least several times stronger, reckons Mr Abel. That means far fewer would break in storms.

There are many different ways used by companies to make conductive fibres. Textiles can simply be intertwined with filaments of stainless steel or other metals, or they can be dipped in liquid metals such as aluminium and magnesium. The surface of a fibre can be melted until it is sticky enough to capture sprayed particles of carbon. A particularly tricky process involves dipping fibre into sulphuric acid to create toe-holds that, after being soaked in palladium salt and a nickel-plating solution, become encrusted with nickel crystals. The now-conductive fibre is then rigged to a charged copper ingot in a bath, with the result that copper particles electroplate its surface. Mr Abel, who helped design this process at Syscom, left the firm to develop a system that instead uses an ion beam to drive metal particles into fibre like “billions of tiny bullets”.

Rarely is much metal needed. Copper fibre, for example, may contain just a third of the copper in the solid wire it replaces. Fibres of stainless steel made by R.STAT, a French firm, are under 12 microns in diameter—less than half the thickness of a human hair. It is so soft to handle that people cannot tell it is made from steel, says Pascal Peninon, an R.STAT manager.

More exotic applications are emerging. CanShielding, an Ontario firm, is developing lightweight carbon- and silver-fibre aprons to protect x-ray technicians. The garb is more comfortable than the heavy gear the technicians now don. The company is also developing a fabric that partially absorbs radar signals.

Smart underwear is likely to be a hot fashion item in the future. An American lingerie firm has shown interest in a textile called Fabcell that uses liquid-crystal inks to change colour when its fibres are warmed by a battery, says its inventor, Akira Wakita of Keio University in Japan. SwicoFil, a Swiss company, makes a range of conductive fibres, including a gold-coated thread for Rococo Dessous, which produces luxury lingerie. The catwalks of London, Milan, New York and Paris are bound to get a lot more interesting. ■



Wearing a light show: light-emitting diodes and circuitry woven into a fabric



Catapulting ahead

Electromagnetic launchers: Hurling objects with electrical energy is giving the catapult a new lease of life

AS A jet fighter screams away from the deck of an aircraft-carrier a swirl of vapour trails from the steam-driven catapult that launched it into the air. Catapults are an ancient technology, developed from the crossbow for increased range and firepower. By the Middle Ages, they could hurl rocks as big as 75kg (170 pounds) to batter castle walls. From using the kinetic energy stored in twisted ropes and sinews to launch projectiles, catapults were developed using hydraulics, gravity and air as propellants. Steam became a favourite with naval architects because it was on tap, generated by the engines of ships. Now catapults are going electronic and finding new military and civilian roles.

Despite their punch, the steam-driven catapults on aircraft-carriers are not as powerful as some would like. Even with their engines roaring, catapulted aircraft still need the extra airspeed provided by turning the carrier into a headwind. If there is no wind, you must “crank the ship up” to generate one by sailing faster, says a retired commander of a US Navy warship.

The US Navy is so impressed with the push delivered by its new catapult, the Electromagnetic Aircraft Launch System

(EMALS), that its next aircraft-carrier, the *Gerald R. Ford*, is in effect being built around it, says Captain James Donnelly, manager of the launcher. EMALS can accelerate a heavy warplane to 180 knots (333kph)—about 30 knots faster than a steam catapult. As the acceleration can be finely adjusted every millisecond, it produces smoother launches, which are better for pilots and aircraft.

The system is being fine-tuned by General Atomics, a defence contractor, at an airfield in Lakehurst, New Jersey. Just under the runway lies a nearly 100-metre array of electromagnets straddled by a sliding, conductive armature. Precisely timed pulses of electricity create a wave of magnetism which rapidly pushes the armature along. The armature is connected to a shuttle on the runway above, to which the aircraft's nose wheel is hitched.

The technology is similar to the linear-induction motors employed in some high-speed trains—except, of course, trains are not expected to take off. The Lakehurst system can propel the shuttle to the other end of the runway in just 2.4 seconds, says Mike Doyle, the programme's chief technology officer. But it takes a lot of energy, more

even than a nuclear-powered aircraft-carrier can suddenly muster. Hence energy is stored kinetically in rapidly spinning rotors and released to power generators whenever the catapult is fired.

Such kit is not cheap. The four-catapult system for the *Gerald R. Ford* has a price tag of some \$750m. But it eliminates all the tentacular plumbing of steam catapults and should cut crewing and upkeep expenses by about \$250m over its expected 50-year life, the retired commander estimates. Being much lighter it will also make the aircraft-carrier more stable, manoeuvrable and cheaper to propel.

EMALS is costly partly because it has to be squeezed into the confines of an aircraft-carrier. Building such a system on land would be much cheaper. This leads some to wonder whether catapults could be used to cut the costs of commercial flying. The engines on airliners guzzle fuel on take-off. Scott Forney, head of General Atomics' electromagnetics business, says that he has been approached by cargo airlines considering this. But could it be used to launch passenger aircraft too?

Fasten your seat belts

Sceptics doubt civil airliners are strong enough to handle the stress of a catapult launch. Airbus, Europe's giant aircraft manufacturer, reckons this problem can be overcome by lengthening the catapult along a runway and accelerating aircraft more slowly. That way only minor reinforcements would be needed, says Charles Champion, head of engineering for Airbus. He thinks electromagnetic catapults could be operating at civilian airports by around 2050.

The
Economist

Events

Over 200 health care executives from across the payer and provider spectrum gathered at *The Economist's Health Care Forum* in Boston on November 12 to discuss how the US can provide high-quality care to its citizens without going broke. The conference, whose sponsors included IMS Health, explored this question via a number of angles—from big data to payment reform to connected health care to the consequences of the Affordable Care Act. Chaired by Charlotte Howard, *The Economist's* health care correspondent, the event offered a full day of provocative and compelling commentary.



"To think we're going to have one [payment] model that encompasses the entire US is flawed. Anybody who travels the US just sees the very different opinions people have in different parts of the country toward government and health care."

Ralph de la Torre
Chairman and chief executive of Steward Health Care System
Payment reform: Cheap, good, accessible health care



"We have high hopes the dramatic technological and regulatory changes we are seeing will lead to a vastly improved health care system, where information from different silos is integrated and connected so we can determine what works well and what doesn't."

Sati Sian, Senior vice president of global technology services & operations for IMS Health
Innovation through connected health care

"The momentum now is around measuring patient satisfaction rather than measuring health outcomes. But if we measure patient satisfaction only, we'll get the increased expense of bigger TV screens or fluffier pillows without the added benefits of improving health outcomes in ways that reduce costs down the line by having people be less sick."

Elizabeth Teisberg
Professor, The Dartmouth Center for Health Care Delivery Science
Evidence-based medicine: Calculating risk and reward



"The exchanges are intended as far more than just a distribution vehicle for subsidies; what they are intended to do is to aggregate purchasing power and accelerate the changes the market needs—which is really changing how health care is delivered."

Jean Yang
Executive director of Massachusetts Commonwealth Health Insurance Connector Authority
Exchanges and beyond: Lessons so far



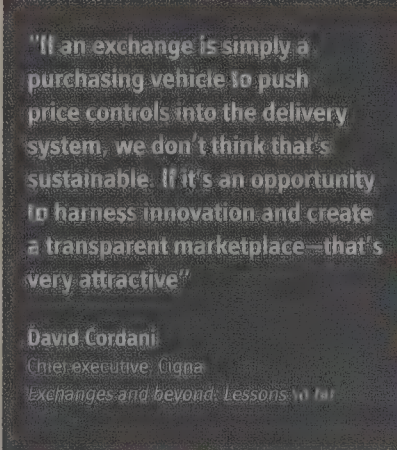
"When you think about health care being delivered in locations where consumers live, work, play and shop, where you can make appointments and walk-in 80 hours a week for non-emergency situations, we see tremendous opportunity for growth."

Alan London
Chief medical officer of Lake Care Health Systems at Walgreens
Retail RX: Corner store care



"The next decade is probably going to be one of a lot of employer experimentation as they try to figure out what works best in this new world. You're going to see people looking at defined contribution strategies, you're going to see some employers going to the exchanges, and some employers deciding they're going to contract directly with providers."

Tracy Watts
National leader for health care reform, Mercer
The employer picture: How organizations are responding to ACA



"If an exchange is simply a purchasing vehicle to push price controls into the delivery system, we don't think that's sustainable. If it's an opportunity to harness innovation and create a transparent marketplace—that's very attractive."

David Cordani
Chief executive, Cigna
Exchanges and beyond: Lessons so far



Additional Featured Speakers: **Stefan Linn**, Senior vice president of strategy & global pharma solutions, IMS Health; **Elliott Fisher**, Director of Dartmouth Institute for Health Policy & Clinical Practice; **Dora Hughes**, Senior policy advisor, Sidley Austin LLP; **Bill Crown**, Chief Scientific Officer, Optum Labs; **Peter Neumann**, Professor of medicine, Tufts University; **Ben Wanamaker**, Executive director of health care, Clayton Christenson Institute; **Barbara Spurrier**, Administrative director, Mayo Clinic Center for Innovation; **Sheikh Usman Iqbal**, Head of oncology, global evidence & value development medical affairs, Sanofi-Aventis; **Richard Liebowitz**, Chief medical officer, New York-Presbyterian Hospital; **Kevin Patrick**, professor of family and preventive medicine, University of California, San Diego; **Charlie Schick**, Director of big data, healthcare and life sciences, IBM; **Iya Khalil**, Co-founder and executive vice president, GNS Healthcare; **C. Martin Harris**, Chief information officer, Cleveland Clinic; **John Haslinger**, Vice president of benefits outsourcing consulting, ADP; **Rishi Manchanda**, President and founder, HealthBegins; **Clay Richards**, President, naviHealth; **Joan Saba**, Partner, NBBJ; **Meghan Fitzgerald**, President, Cardinal Health Specialty Solutions; **Hooman C. Hakami**, President & chief executive, Detection & Guidance Solutions, GE Healthcare Systems

imshealth™

A railgun has the ability to hurl a slug of metal much farther than artillery can and at speeds far exceeding those of missiles

► Beside saving fuel, a catapult-assisted take-off would also reduce noise and allow runways to be shortened, reckons Mr Champion. That could increase the capacity of airports.

The aircraft, of course, would also have to land on these shorter runways. Cables are used to catch a tail-hook on planes landing on carriers. Something similar could be employed on runways; arresting cables are already used on short runways at some military airbases. For civil aircraft, though, it would be necessary to decelerate the landing more slowly so as not to jolt passengers. The energy captured by the cables could be stored and reused for catapult launches, suggests Mr Champion.

Back to battle

Catapults are also making a comeback as a way to launch projectiles and missiles. Some naval missiles are ejected with a burst of pressurised gas or a small booster charge before the rocket in the missile ignites. This reduces the risk of a warhead detonating in the launch tube. Launchers using linear-induction motors coiled inside a tube have been developed, but these coilguns showed mixed results.

Another system, known as a railgun, offers more promise. Inside the barrel of a railgun are a pair of parallel metal rails and a sliding conductive armature. The armature cradles the projectile to be fired or, in some cases, is the projectile. When electrical energy accumulated in a bank of capacitors is rapidly pulsed into the rail, it creates an instantaneous magnetic field which flings the armature out with explosive force (see picture). A railgun can hurl a slug of metal much farther than artillery can and at speeds far exceeding those of missiles. The slugs destroy things with the force of their impact rather than detonating an explosive warhead.

The US Navy's railgun programme, aptly named *Velocitas Eradico*—"I Who Am Speed, Destroy" in Latin—has made brisk progress since it began in 2005. Working primarily with General Atomics and Britain's BAE Systems, the muzzle energy of shots has increased from six to 32 megajoules, enough to hammer targets beyond 160km (99 miles) at more than five times the speed of sound (sound travels at about 1,230kph), reckons Nevin Carr, a retired rear-admiral and former head of America's Office of Naval Research.

The slugs can be heavy. General

Atomics has produced a railgun able to hurl a 10kg projectile more than 200km in less than six minutes (that's 2,000kph). Some slugs fly fast enough to hit a target 30km away with a straight trajectory, says John Finkenaur, a railgun expert at Raytheon, another defence contractor. Slugs are cheaper than missiles and, lacking propellant and explosives, are safer to store.

Railguns, though, can be awkward. They get hot and wear rapidly. Some railguns had to be dismantled after two or three shots to make sure components were holding up. Now some can handle 100 shots and computer models suggest this might be multiplied sixfold, giving railgun barrels roughly the same lifespan as five-inch naval guns, says Mr Carr.

This greater durability is due in part to better x-ray and ultrasound diagnostics for inspecting new alloys used in the construction of railguns, and improved cooling techniques. Some research groups with highly effective cooling systems are clocking up "velocities they can't talk about", says Alexander Zielinski, a former railgun designer at the US Army Research Lab in Maryland. An added advantage of cooler railguns is that they are harder to attack with heat-seeking missiles.

Researchers have managed to fire slugs containing sensors and an explosive charge to generate shrapnel in mid-air. This would help railguns smash incoming missiles. Keeping the electronics and explosives intact at launch requires "shaping" the energy as it is delivered to the projectile so that it accelerates a little more gently, says a former US defence official. It requires a long barrel, and some railgun barrels already extend more than ten metres.

Work funded by DARPA, a Pentagon research agency, has also led to an electro-

magnetic mortar. Designed like a railgun and powered by electricity generated by a vehicle, its range is twice that of the roughly 8km reached by conventional mortars, says Harry Fair, founder of the group behind the project at the University of Texas, Austin. Neither it nor a coilgun-mortar designed by Sandia National Laboratories is in volume production. Nevertheless, such work points to electromagnetic weapons spreading beyond the navy.

General Atomics is building a wheeled railgun for sale to land forces, and researchers in China are trying to produce one that can shoot slugs at 2.5km per second. At greater speeds the friction from air deforms the projectile's aerodynamic profile, which can cause it to stray off course.

There are uses beyond weapons. Some at NASA, America's space agency, have argued for a mountaintop railgun to help lob payloads into space. Chemical rockets would still be needed to accelerate the vehicle to orbital speed and to manoeuvre it. Many consider the concept "out there on the edge", says Douglas Witherspoon of HyperV Technologies, a Virginia firm that investigated the possibility by building a tabletop launcher using a spiral-shaped railgun called *Slingatron*.

HyperV is, though, making progress with another exotic railgun. Rather than use metal as an armature, the firm strips ions from a few milligrams of argon gas and uses the resulting conductive plasma to transfer electrical energy from one rail to another. In a vacuum it can fire a plasma blob at nearly 150km a second—fast enough to initiate fusion in a deuterium and tritium fuel. HyperV hopes to use it to design the world's first commercially viable, power-generating fusion reactor.

Whether or not the firm succeeds, there are plenty of down-to-earth ideas about what to do with electromagnetic catapults. Elon Musk, the billionaire founder of PayPal, Tesla Motors and SpaceX, has proposed using them to propel passenger pods at more than 1,200kph along an elevated track between Los Angeles and San Francisco. More prosaically, IAP Research, a technology-development company based in Dayton, Ohio, has come up with something for the handyman. With funding from a toolmaker it has produced a prototype electromagnetic gun that drives nails into concrete. Dave Bauer, the firm's founder, expects it to be in hardware stores within a couple of years. ■



A railgun lets rip

The DNA of materials

Angela Belcher is a materials scientist who makes things with viruses. She is now using them to attack cancer

"IT'S getting a little challenging," says Angela Belcher. "I feel I am having to make choices now, which I never really wanted to." But there are only so many hours in the day and she already combines multiple academic disciplines into a repertoire of research that spans an ambition to drive an electric car powered by a virus battery to building better touch-screens for digital devices and lately to giving surgeons new tools to detect and potentially treat minute traces of cancer.

There is more, but as eclectic as her work seems, it is united by a single intriguing idea. Evolution is a great problem solver and over millions of years has produced creatures of incredible breadth and complexity that can survive in the changing world around them. So why not copy the way nature innovates, speed it up and use it to help solve some of the problems researchers are presently working on. And that, in essence, is what Dr Belcher and her colleagues at the Massachusetts Institute of Technology (MIT) do. They rapidly evolve genetically engineered organisms to manufacture new materials and devices.

From the ocean

It began in the 1990s with an abalone shell, the sturdy home of a mollusc with a beautifully decorated mother-of-pearl interior. Dr Belcher was researching her PhD at the University of California, Santa Barbara, and was studying how abalones build their shells. The molluscs produce proteins which combine with ions of calcium and carbonate in seawater. This provides the material for them to make two types of crystals, which they assemble into layers to create an immensely strong composite structure.

As she looked out of the window one day while wondering about this, her gaze drifted to a periodic table of elements stuck on the wall. If an abalone has within its DNA the ability to code for the proteins needed to gather the materials to construct a shell, would it be possible to tinker with the DNA sequences in other creatures to gather some of the elements on the periodic table? In particular, Dr Belcher asked herself, could creatures build semiconductors like those used in electronic circuits?

The idea might seem far fetched, but Dr Belcher thought that the reason it had not happened before could be that nature had never been given the opportunity to try. Sea creatures once had soft bodies but started to build shells and bones 500m years ago in a geological period known as the Cambrian. That could have been in response to increasing levels of minerals in the ocean. "It took them 50m years to get good at it," says Dr Belcher. "Students in a research lab are not that patient." So the process would need to be speeded up.

The leap from evolutionary biology to semiconductors came naturally to Dr Belcher. She did her bachelor's degree in creative studies and was allowed to combine different sciences. This highly multidisciplinary approach continued with her three PhD supervisors being experts in molecular biology, chemistry and physics. But it caused a bit of a problem with her first grant proposal in 1999, on becoming a professor at the University of Texas, Austin. The project was to find bacteriophages (a type of virus that infects bacteria, not people) that could be genetically engineered to bind to inorganic materials that they would not normally have an affinity for—in particular, semiconductors. If that was possible, then the viruses might be used as a template to grow and assemble electronic circuits, much like an abalone constructs its shell. It was, said one reviewer of her proposal, an "insane" idea.

Nevertheless, Dr Belcher stuck with her research and eventually was funded by the US Army. (Though interested in promoting basic science, the army likes to keep a look-out for potential breakthroughs in electronics which might benefit the increasing amount of technological kit it now uses.) In a paper published in 2000 in *Nature*, Dr Belcher demonstrated that her idea did indeed work. In 2002 she joined MIT and further scientific papers followed in collaboration with a number of her colleagues. Some of those papers explored making the components of a battery using viruses.

The technique begins by genetically modifying the somewhat basic DNA of a bacteriophage. This can be done to produce small but multiple changes in a billion or so viruses. All these variants, huge in number but individually tiny enough to be contained in a droplet of liquid, are then exposed to the material which the researchers are interested in manufacturing. Any viruses that show an affinity towards the material by attaching to it are gathered up. There may be only



"I think it is very appealing that you can grow environmentally friendly battery parts"

► one or two in a billion, but when these candidates are used to infect a bacteria, millions of copies with identical DNA are made. The process can then be repeated to refine the characteristics. It is akin to high-speed natural selection. With further genetic modification and by changing the growth conditions, the selected viruses are used to bind with specific materials and assemble battery components.

Having found viruses happy to attach to nanowires of cobalt oxide, the researchers were able to produce a negative anode, one of the two main functioning parts of a battery. Making a positively charged cathode, the other important bit, was more difficult because for a battery to work well the cathode needs to be highly conductive. Nevertheless, Dr Belcher and her colleagues succeeded in getting some viruses to attach to carbon nanotubes, which are very good at conducting electrons. This resulted in a suitable cathode. It was then possible to assemble virus-made components into a small cell battery capable of lighting up an LED. This work was published in *Science* in 2009, to wide acclaim. Even Barack Obama was given a demonstration of the battery in action.

Viral motoring

What Dr Belcher would really like to do, however, is to scale the process up so that one day it is possible to produce a virus battery powerful enough to run an electric car. With a paper in *Nature Communications* in November 2013, that day moved a step closer. The MIT team demonstrated how to use viruses to make a lightweight lithium-air battery, which the researchers think could have an energy density more than twice that of the best lithium-ion cells, the type which are currently used in most electric cars, as well as myriad portable electronic devices. But there is still a long way to go before such a battery could be put into commercial use.

Many still find the idea strange. "I am sometimes told: 'what are you doing using a virus to make a battery? These things don't go together,'" says Dr Belcher. Yet, as she points out, biological processes tend to be non-toxic, low-energy ways to make things, and result in little waste, unlike many conventional manufacturing processes in which batteries are made with noxious materials in energy-intensive factories. "I think it is very appealing that you can grow environmentally friendly battery parts," she adds.

When scaled up for commercial use, the viruses may take a back seat. This is the

case with some of Dr Belcher's projects which are already in the shops. In 2002, along with Evelyn Hu, a materials scientist then with the University of California, Santa Barbara, Dr Belcher co-founded Cambrios. This is a Silicon Valley company which makes transparent silver nanowires for use in touch screens. The nanowires are contained in inks which can be spread across the screen to provide a grid that produces an electrical signal when touched. The production process itself does not use viruses, but is based on techniques employed by them.

A number of companies are now using Cambrios's technology in the screens of their smartphones, tablets and televisions. In December 2013 3M, a giant American maker of numerous innovative products, said it would employ Cambrios's nanowire ink in a film that can be used to make giant, flexible touchscreens.

Siluria Technologies, another Californian company, was co-founded by Dr Belcher in 2007. It uses viruses to produce templates for materials that work as catalysts to stimulate novel chemical reactions. Siluria is developing a catalytic process to turn methane, the principal component of natural gas, into petrol (gasoline) for cars. America now has an abundance of natural gas, thanks to the hydraulic fracturing, or "fracking", of underground rocks. Siluria is building a demonstration plant near Houston to scale up the process and prove its commercial potential.

The same basic virus toolkit is now being used by Dr Belcher and her colleagues in the medical field. Dr Belcher is a member of two MIT faculties: materials science and engineering, and biological engineering. In 2010 she added a third by joining MIT's Koch Institute for Integrative Cancer Research. She was nervous about this: "Working on cancer is so important. I didn't want to take up space and not contribute and make a difference." But she attended tutorials and became more confident by considering cancer as yet another material to work with. Although it is early days, the work looks promising.

The plan is to produce a medical probe which can be used to locate extremely small tumours. One way this is being tried is to get genetically engineered viruses to latch onto carbon nanotubes which glow under light from a laser. These viruses carrying the tubes would be injected into the body, and with light shining on the skin, be capable of glowing up to 10cm or so inside the body. The glow can be de-

tected with a specialised camera.

To get these beacon viruses into the right places, the researchers engineer them to have a second affinity, one that makes them bind to certain kinds of cancer cells. They would then find any tumours, attach to them and glow.

The technique is still experimental and is being tried out in the laboratory on cellular models of ovarian cancer, which can be difficult for surgeons to detect when the tumours are tiny. There is a lot to do, but, says Dr Belcher, "I know we can find very small tumours and that should allow surgeons to remove them."

It also raises an obvious question: if the viruses can find tumours and light them up could they also carry with them some kind of lethal weapon? Not surprisingly, that possibility is being explored, with attempts to engineer cancer-seeking viruses that can carry both an imaging material and a chemotherapy agent.

Dr Belcher's idea of evolving organisms to help build novel materials and new devices is starting to look like a technique with a large number of potential applications. Already she has to be able to switch from discussing with one group of her colleagues the complexities of binding materials to cancer cells, to debating with others how to clean up industrial wastewater with genetically engineered yeasts (her work is not confined to tinkering with the DNA of viruses). "There are so many areas we would like to be involved in, but, we can't do them all," Dr Belcher laments. The trouble is, her idea born from an abalone shell seems bound to turn up even more problems which are waiting to be solved. ■

Offer to readers

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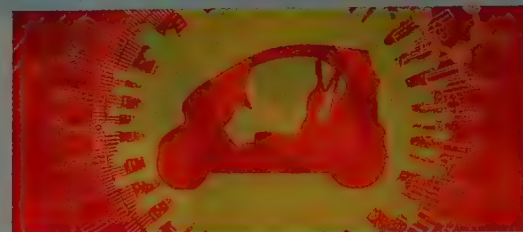
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African demography

The dividend is delayed

Hopes that Africa's dramatic population bulge may create prosperity seem to have been overdone

HOW unusual is Africa's demography? If you take a selection of countries, from Algeria and Tunisia in the north to Botswana and South Africa in the south, you may answer: not that unusual. In the early 1960s those nations had fertility rates of between 5.5 and 7.5, meaning the average woman there could expect to have that number of children during her lifetime. That was about the same as fertility in Brazil, China, Indonesia and Mexico at the time. Now, all the countries have similar fertility rates of between 1.5 and 3.0. The main difference is that the Asian and Latin American nations saw their fertility decline at a fairly steady pace over the past 50 years, whereas the African ones saw their fertility stay high until the mid-1980s, then fall sharply.

But a recent study by two French-speaking demographers, Jean-Pierre Guengant and John May*, casts doubt on this picture of convergence between Africa and the rest. The north and south of the continent, they say, are exceptions. Most of Africa is catching up too little, too late. The result is that the continent's overall population will rise sharply, its big cities will grow alarmingly, and though its labour force will also expand (which is potentially good for growth), its coming "youth bulge" will be hard to manage. They conclude that governments must do much more to encourage and improve family planning.

Recent census and survey data suggest

that African fertility is falling more slowly than the UN had expected in 2010, when it produced its regular worldwide population survey. Since then, 17 African countries with half the continent's population have reported fertility rates higher than the UN had estimated. Only ten, with 14% of the population, came in lower. In almost all countries fertility is falling. But in about half of them, the fall has slowed down and in a few cases it has stopped.

Using recent figures, Messrs Guengant and May divide Africa into four groups (see map on next page). The first are those which really are converging, with fertility rates below 4.0. There are 13 of them, and they have 22% of the continent's population. All are either in the north or south, or are islands, such as the Seychelles. Not a single one is in west, central or east Africa.

Africa has 40 other countries (not including South Sudan, which has not yet had its own census). Fifteen have fertility rates between 4.0 and 5.0. They are only starting to converge. This is a group whose members have seen striking falls in fertility for a few years, which have then stalled. They include some of the continent's recent relative economic successes, such as Ghana, Rwanda and Ethiopia, but also a few abject failures, such as Zimbabwe and the Central African Republic. They have the same share of the continent's population as the first group, 22%.

The next group is almost as large as the

first two combined. Its 16 countries include Africa's giant, Nigeria, which has 170m people, and they account for 37% of the population. They are not really converging—their fertility rates are between 5.0 and 6.0—though their demographic patterns are starting to change, fitfully.

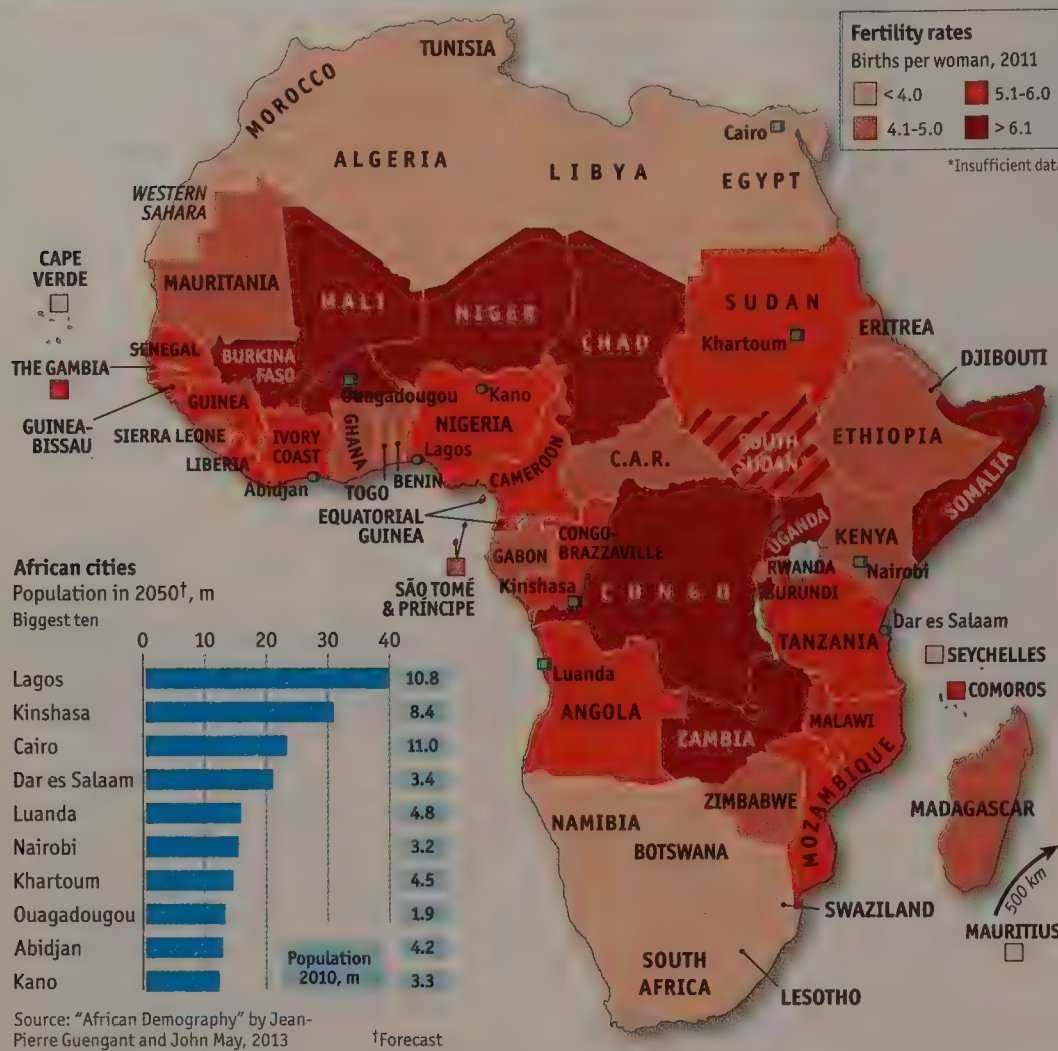
And the last group is seeing even less change. Its members have fertility rates over six, not so different from the 1960s. Most are landlocked; most have low rates of urbanisation. They include Uganda, the Democratic Republic of Congo and Niger, which, at 7.5, has the highest fertility rate in the world.

Add the last three groups together and you find that 78% of Africa's people live in countries where the transition to low fertility and low mortality (characteristic of the rest of the world) is nowhere near finished. Hence the conclusion that most of Africa is not catching up with the rest.

From a tenth to a quarter

That has big implications for the overall size of the continent's population. There were 1 billion Africans in 2010. The UN, using its "medium projections" (which imply continued convergence), reckons that the population will increase to 1.6 billion by 2030 and will double by 2050. But if the past few years are any guide, these medium projections are too low. According to the UN's "high variant" (which implies a slower fall in fertility), Africa's population will rise to 2.7 billion by 2050. If that were to happen, Africans would then account for more than a quarter of the world. In 1970, they made up only a tenth.

Such an increase in population would be associated with enormous rises in urbanisation and in the number of children. In 2010 Africa had three cities with over 5m inhabitants (Cairo; Kinshasa, Congo's capital; and Lagos, Nigeria's commercial capi-



Diplomacy in the Gulf

No one is happy

CAIRO

Americans, Saudis and Qataris are in an unusually knotty diplomatic tangle

BARACK OBAMA already faced a long and tricky agenda for his visit to Saudi Arabia scheduled for later this month. Sixty-nine years after Franklin Roosevelt and King Abdul Aziz bin Saud, the country's founder, forged an alliance aboard an American cruiser in the Suez canal, the two nations find themselves at odds not only over such perennial irritants as Israel and human rights, but increasingly over newer issues, from Gulf security to the Syrian civil war and to post-revolutionary troubles in another prickly ally of America, Egypt.

Saudi Arabia has now added yet another complication. Along with its close allies Bahrain and the United Arab Emirates (UAE), the kingdom on March 5th abruptly recalled its ambassador to Qatar. That small emirate, which juts out of Saudi Arabia like a tiny thumb from a big fist, is not only a fellow member of the Gulf Co-operation Council (GCC), a six-country club of oil-rich Arab monarchies. Qatar also happens to host the Combined Air and Space Operations Centre, the most critical of the constellation of American military bases around the Gulf, together serving some 35,000 American troops, that have long shielded the GCC and acted as a prod to their mutual foe, Iran.

This diplomatic tiff between Arabs may well be contained. After all, Saudi Arabia suspended ties with Qatar for several years in the 1990s in anger at the overthrow ▶▶

tal). By 2050, it could have 35, with Kinshasa and Lagos each exceeding 30m. Other burgeoning mega-cities are Tanzania's Dar es Salaam, Kenya's Nairobi and Angola's Luanda (see chart). Providing basic services to them all will be a nightmare.

There were 411m African children in 2010, aged 14 years or below. By 2050 there will be 839m, according to the UN's high variant. Educating all those young minds will be expensive. It is true that there will also be lots of new arrivals into the labour force, who should be able to earn the money to pay for their younger siblings to go to school. In 2010 there were roughly 200m Africans between 15 and 24 years of age and this number could rise to over 450m by 2050. But the African Development Bank pointed out in 2012 that only a quarter of young African men and just 10% of young African women manage to get jobs in the formal economy before they reach the age of 30. The vast majority of young Africans will continue to have precarious employment—a worrying prospect.

To make matters worse, many economists fret that the recent story of "rising Africa"—a virtuous circle of economic growth and improved governance—is already starting to wear thin. Dani Rodrik of Princeton University, for example, reckons that manufacturing and private investment have hardly budged despite a decade of rising incomes. Some economists, to be sure, say that Africa is ripe for a manufac-

turing surge. But it is still the case that African growth depends heavily on commodity exports to China, where demand for raw materials is slowing.

In these circumstances, the demographers argue, African governments need to make a bigger effort to spread family planning. Over 60% of women of child-bearing age use modern contraceptive methods in South Korea, Mexico and Bangladesh. In most of sub-Saharan Africa, the rate is below 20%. Until recently, some governments, such as Uganda's, even discouraged family planning, though that is changing on the whole. The bigger problem is that social attitudes are not changing much—so, Messrs Guengant and May argue, governments have to do more.

Family planning is not expensive. According to the Guttmacher Institute, an American think-tank, it would cost about \$1.5 billion a year to provide modern contraceptives to all African women aged 15-49 who do not get them. The countries where they are used most frequently are also the ones catching up fastest with the rest of the world. Unless the other African countries follow suit, the continent will see its demographic convergence lag behind; it also risks getting stuck, by having too many people with too few chances of escaping poverty. ■

**"African Demography", by Jean-Pierre Guengant and John May. *Global Journal of Emerging Market Economies*.



The Saudis' King Abdullah is not amused

of a friendly emir by his son, Sheikh Hamad al-Thani, father of the current ruler, Sheikh Tamim. Qatar responded to the latest rebuke with mild "regret and surprise", saying its own envoys would stay put in "brotherly" GCC capitals.

Cut them off?

But the row has been brewing for some time, and could get worse. Rumours suggest the Saudis have quietly threatened to seal their border with Qatar, the emirate's sole land link to the outside world, as well as to close Saudi airspace to Qatar-bound flights. This would bother the Americans, who co-ordinate all their military activity in the air space between Syria and Afghanistan from their base in Qatar.

The reasons for Saudi fury are plain. Starting with the launch of Qatar's noisy Al Jazeera satellite channel in 1996, the emirate's openness to Arab political dissenters (except from within the emirate itself) has rubbed up against its autocratic neighbour. Anger grew with the outbreak of the Arab spring in 2011, not only because the Saudis (and most other Arab monarchies) saw the uprisings as a threat, but because Qatar has doggedly and generously backed the re-emergent Muslim Brotherhood in every ensuing contest, from Libya and Tunisia to Egypt and Syria. The Saudis, and perhaps even more so the UAE, have long viewed the Brotherhood as a subversive cult whose pan-Islamic ideology and secretive, cell-like structure pose a singular danger.

When the Brothers won elections in Egypt in 2012, Qatar poured in money to prop up their man, President Muhammad Morsi. Since Egypt's generals overthrew him last year, the Saudis, Kuwaitis and other allies have sloshed in far more cash. Qatar, meanwhile, has served as a haven for fugitives from Egypt, including hardened jihadist extremists as well as besuited Brotherhood politicians. Al Jazeera's Arabic channels, demonised in Egypt to the point that staff in its independently run English-language division are being tried as terrorists, have become lonely pulpits for the Brotherhood. Al Jazeera's star preacher, Yousef al-Qaradawi, rails against Arab regimes that he says were complicit in the "crimes" of Egypt's coup leaders. Mr Qaradawi lives happily in Qatar.

An explanatory joint statement from Saudi Arabia, Bahrain and the UAE accused Qatar of breaching a pledge, made by Sheikh Tamim in November, to tone down such invective and "abide by the principle of non-interference in other countries' internal affairs". Less officially they are said to be demanding the expulsion or extradition of Islamist exiles. On March 3rd a court in the UAE sentenced a Qatari doctor to seven years in prison for alleged conspiracy, in the latest of several trials targeting suspected Brotherhood

cells. Saudi Arabia for its part recently banned Brotherhood works from the Riyadh Book Fair and blocked suspected members from preaching in mosques.

Mr Obama will have to tread carefully. He must convince Iran that America's Gulf alliance remains strong, while persuading fissiparous Arab doubters that America, hoping for a nuclear deal with Iran and simultaneously reducing its armed forces and seeking to "pivot" towards Asia, has not gone soft on what the Arabs see as a Persian threat. Mr Obama must also explain his reticence to help either Syrian rebels or Egypt's generals, even as his Gulf allies press for a bigger commitment. Mr Roosevelt, by comparison, had it easy. ■



Jordan and the Palestinians

A kingdom of two halves

AMMAN

Jordanians chafe at an emerging American plan for Israel-Palestine

WESTERN powers have long found money a good way of persuading the Hashemites, who rule Jordan, to do their bidding. A century ago, T.E. Lawrence, a charismatic British officer, persuaded them to rebel against the rule of the Ottoman Turks by letting them loot the trains they blew up. In more modern times, hefty dollops of aid have persuaded them to provide military facilities for the Americans in their war in Iraq and to accommodate the region's periodic splurges of refugees, most recently from Syria. Surely, Western officials say, for the right price, currently estimated in the tens of billions of dollars, the Jordanians will help John Kerry, America's secretary of state (pictured above with King Abdullah) to fix a settlement of the Is-

raeli-Palestinian conflict by absorbing the 4.5m Palestinians who live in the kingdom, including the 3.5m who are now Jordanian citizens.

Or will they? Indigenous Bedouin from Jordan's East Bank, who number about 3m, worry that America's plans to persuade Palestinian leaders to strip generations of refugees of their claimed "right of return" to what is now Israel would reduce Jordan's original inhabitants to a permanent minority. Tribal leaders fret that the refugees, barred from Israel, would campaign for full rights in Jordan, over time turning the kingdom into a second Palestinian state. The Bedouin would lose their preferential access to government jobs. They might also be deprived of the skewed electoral system that has hitherto ensured that they control Jordan's parliament. "Kerry is destroying our home," says a Jordanian analyst. "He is trying to solve one conflict by creating another."

Parliamentarians from Jordan's East Bank (ie, non-Palestinians) intent on scuppering Mr Kerry's plan say the Palestinians must uphold their right to return to Israel. Campaigners are denounced as American collaborators for calling for more rights for those 1m Palestinians resident in the kingdom who still do not have Jordanian nationality. When Mustafa Hamarneh, a Jordanian MP of Palestinian origin, suggested giving the children of Palestinian refugees access to Jordanian state education, health care and a driving licence, he was labelled a Zionist agent.

Nervous lest they be accused of selling out, many of Jordan's own Palestinians are also opposing Mr Kerry. After four generations in Jordan, most are unprepared to go anywhere else, but do not want to admit it. Many also fear that Jordan's government may pocket any compensation supposedly earmarked for Palestinians to persuade them to drop their demand to get back their old homes in Israel. Jordanian officials suggest that Jordan should receive \$500m for each of the 65 years they have hosted the refugees, while the country's Palestinians suggest that each family should be compensated for the properties that Israelis took after 1948. The Palestinians in Jordan also argue that, far from being a burden, they have been responsible for building up Jordan's economy.

Nice to be a buffer

Jordan's king may also have reason to flinch at Mr Kerry's plans. Not only would a Palestinian state compete for some of the aid that now comes his way, but it might also steal the kingdom's vaunted role as a buffer between Israel and a turbulent Arab world. If a Palestinian state were to emerge, replete with an American-backed force between Israel and the Jordan river, it could claim that role. The Jordanians are reluctant to lose it. ■

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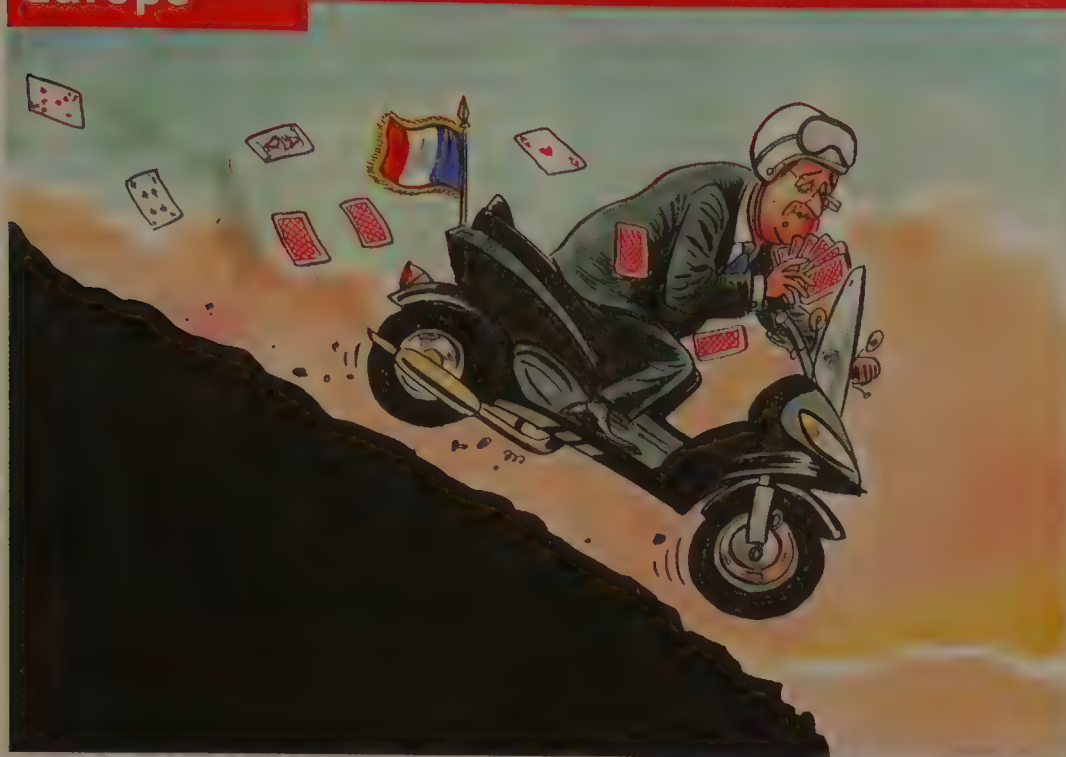
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*2013/2014 App Store, Telegraph; 2013/2014 Newspaper, May 2014

**iPhonics, Consulting Group Monitor, April 2014

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France's government

François Hollande mulls a reshuffle

PARIS

The French president badly needs a fresh start to regain his zip—and that is likely to mean a new government

WHEN in trouble, ditch the prime minister. This has been a guiding principle of many modern French presidents, who enjoy sweeping powers to change prime minister as they please. François Mitterrand, a Socialist president, went through seven; Jacques Chirac, his Gaullist successor, used up four. With his popularity crumbling like a buttery croissant and local elections approaching, François Hollande needs a fresh start. But the calculation over a reshuffle is far from simple.

When voters go to the polls for local councils in late March and for the European Parliament in May, Mr Hollande will face his first nationwide electoral test since winning the presidency in May 2012. Although his Socialist Party will probably retain the Paris mayoralty, the overall result is likely to be crushing. Voters are fed up with Mr Hollande. His poll rating fell in March to 17%, according to TNS Sofres, a pollster, lower than any other modern president at this point in his term. In another poll, which a French newspaper decided not to publish, 56% thought that Dominique Strauss-Kahn, the disgraced former IMF boss, would do a better job.

Mr Hollande's private life has made him faintly ridiculous: he was snapped by the paparazzi on a scooter visiting a French actress, prompting his break-up with Valérie Trierweiler. More worrying, voters do not trust him on the economy after he promised repeatedly, and against the

trend, to bring down unemployment by the end of 2013. Latest figures do show a small fall in the fourth quarter, but then another rise in January. The economy remains fragile, with growth forecast at only 1% this year. And France will overshoot its budget-deficit target of 3.6% of GDP in 2014. In a damning assessment on March 5th, the European Commission singled France out for specific monitoring on this score, adding that it needed "decisive action" to fix economic weaknesses.

For a moment in early January it looked as if Mr Hollande was carrying out a bold U-turn, promising a business-friendly "responsibility pact" of payroll-tax cuts in return for job creation. But two months on, there is a sense of drift as discussions meander on. The precious mix of inexhaustible energy and authoritative calm seems to elude both the president and his prime minister, Jean-Marc Ayrault. If it is possible to be a pale shadow of Mr Hollande, Mr Ayrault is it. His own rating, one point below Mr Hollande's, is the lowest for any prime minister at this point in the job since TNS Sofres began polling in 1978.

As a result, Paris is rife with speculation about an imminent reshuffle, paralysing decision-making further. In recent months, rival candidates to replace Mr Ayrault have been preparing themselves, some more subtly than others. Foremost among them is Manuel Valls, the ambitious 51-year-old interior minister. His blend of social tough-

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ness and economic liberalism makes him an unusual Socialist. One recent poll has him as the most popular choice to be the next prime minister—with the most enthusiastic support coming from centre-right voters. With his astute treatment of the media and reputation for decisiveness, Mr Valls could reinvigorate a reformist government. Yet, as he has trampled on his colleagues' ground and displayed too much eagerness for the job, Mr Valls's non-stick quality has begun to wear off. Mr Hollande would find it hard to trust him.

An Ifop poll now suggests that Mr Valls has lost his place as the most popular member of the government to Laurent Fabius, the foreign minister. Thirty years after he did the job for Mitterrand, Mr Fabius would make an intriguing alternative prime minister. In his current post, he has shown a steady hand and an authoritative-ness that goes down well with the public. Yet there is no love lost between Mr Hollande and Mr Fabius, who almost split the Socialist Party in 2005 by campaigning for a "no" vote to the draft European Union constitution. Mr Fabius once contemptuously likened Mr Hollande to a woodland strawberry.

Either man would be risky for the president. Mr Valls wants the presidency itself, and so would be an unpredictable junior. Mr Fabius might not accept the job, and if he did would expect broad executive powers. Which is why other aspirants, such as Claude Bartolone, the parliamentary speaker, and Arnaud Montebourg, the outspoken industry minister, see themselves as candidates. Mr Hollande is keeping his options open. He could go for safety and turn instead to an old friend, Jean-Yves Le Drian, who has done a solid job at defence. He may hope to spring a genuine surprise—or even to stick with the loyal Mr Ayrault. "Worn out and tired?" Mr Ayrault

► said to *Le Parisien* newspaper in a last-ditch effort to extend his lease. "Not at all!"

Even if Mr Hollande decides to hang on to Mr Ayrault, with a view to replacing him closer to the 2017 presidential election, the odds are that he will still reshuffle the government. The heavier the losses in the elections, the more radical the shake-up. Among those thought to be vulnerable are Vincent Peillon at education and, possibly, Pierre Moscovici at finance. Incomers could include Ségolène Royal, Mr Hollande's former partner and a one-time defeated Socialist presidential candidate, and Jean-Pierre Jouyet, another old friend who is head of the new Public Investment Bank. An inspired, if long-shot, choice for the finance ministry would be Pascal Lamy, former boss of the World Trade Organisation.

A stronger, more experienced team would suggest that Mr Hollande is serious about his new economic policy. A sparser government would help, too; a recent Franco-German joint cabinet meeting embarrassed the French with 37 ministers to Germany's 15. But in the end Mr Hollande needs more than a fresh cast list to fix his popularity problem: he needs results. ■

Germany's public pensions

In the wrong direction

BERLIN

The government is reversing some of its predecessor's sensible pension reforms

AS THE country with the European Union's fastest-ageing population, Germany has repeatedly tweaked its pension system to avert a slow-motion demographic disaster. The biggest reform came during Angela Merkel's first term as chancellor. Then, as now, her centre-right Christian Democrats were yoked with the centre-left Social Democrats in a "grand coalition". In 2007 the coalition decided that the normal retirement age should gradually rise from 65 to 67.

Mrs Merkel has since preached similar demographic and economic sanity to most of her EU partners, criticising France in particular for straying off the right path. So it comes as something of a shock that Mrs Merkel, now in her third term and running another grand coalition, is reversing course. On the campaign trail for last September's election, she promised to raise pensions for older mothers. The Social Democrats countered with promises to let certain workers retire at 63 instead of 65 (not to mention 67). As coalition partners, they will do both at once.

It falls to Andrea Nahles, the labour minister and a Social Democrat who likes to wave the banner of "social justice", to

push the pension package through parliament by the summer so that it can take effect on July 1st. A previous reform let women with children born after 1992 treat three of their stay-at-home maternity years as if they had worked and paid full pension contributions. The new "mother pension" will be for the 8m-9m women (and very few men) who took time off for children before 1992. They will be allowed to count two of those years, instead of just one, as working years for pension purposes.

The second part of Mrs Nahles's reforms, retirement at 63, is aimed at people who have contributed to the pension system for at least 45 years. But Mrs Nahles wants to count not only years spent working or caring for children or other family members but also periods of short-term unemployment. Separately, she will also boost the pensions of people who cannot work due to disability, and spend more money to rehabilitate them.

Individually, these proposals may seem noble-minded. But as a package, the plan is "short-sighted and one-sided," thinks Axel Börsch-Supan, a pension adviser at the Munich Centre for the Economics of Ageing. It benefits the older generation, which is already well looked after, at the expense of younger people who will have to pay higher contributions or taxes. "The financial and psychological costs of the pension at 63 are disastrous," Mr Börsch-Supan says. There will no longer be any incentive to keep working longer. In some cases, people may, in effect, retire at 61, register as unemployed for two years, and then draw their full pensions.

Criticism of the pension changes straddles German politics. Social Democrats who were involved in previous reforms, such as Franz Müntefering, a former party boss, are against. So are members of the business-friendly wing of Mrs Merkel's own party. Employers are opposed, be-

cause they face labour shortages and are trying to persuade older workers to stay in their jobs longer, not leave sooner. Even the churches are critical, on the grounds that the plan violates "generational justice". Germany's EU partners are especially upset. Olli Rehn, the European economics commissioner, has said that the commission may even sue Germany if it goes ahead with the plans.

It is not only the details of the measures that are disturbing but also the overall signal they send, argues Thomas Straubhaar, director of the Hamburg Institute of International Economics. Germany's "sandwich generation"—those in their 30s and 40s who must pay ever more to support their elders and will get ever less in their own old age—will sulk and might even emigrate. The pension package, he says, is testimony only to "the power of the grey hairs", as the grand coalition cynically doles out political gifts to a few favoured groups of voters. ■

Turkish politics

Anatolia (mostly) loves Erdogan

KAYSERI

A bastion of loyalty to Recep Tayyip Erdogan is tested by recent scandals

"WE GAVE you new hospitals, we gave you proper schools," roars the mayor of Kayseri, Mehmet Ozhasaki. Veiled housewives chant back, "Kayseri is proud of you," as the mayor boasts of the achievements of the ruling Justice and Development (AK) party at an election rally in the city's Eskisehir district. Eskisehir was a slum full of squatters and open sewers until Mr Ozhasaki, a local businessman, was elected mayor in 1999. Now its pristine streets are lined with two-storey houses built on land given by AK. Mr Ozhasaki is also restoring an ancient Armenian church. "Kayseri is very nationalist, I am getting criticised for this," he confides.

Sitting next to one of Turkey's highest mountains, Mount Erciyes, Kayseri was once home to thousands of Greeks and Armenians until they were driven out or slaughtered a century ago. Their once grand mansions stand derelict, the basements dotted with gaping holes where looters tunnelled to look for gold. But today Kayseri symbolises the "new Islam" ushered in by AK when it came to power in 2002. This mix of piety and entrepreneurship has produced a class of so called "Islamic Calvinists" who have popularised such things as Turkish jeans and furniture across the world. Abdullah Gul, Turkey's president and a co-founder of AK, is Kayseri's most famous son.



Nahles presents her gifts

Mr Ozhaseki, who was elected with 60% of the vote in 2009, ought to be a shoo-in for a fourth consecutive term as mayor. But a seemingly unending stream of sleaze allegations against AK, and specifically against Recep Tayyip Erdogan, the prime minister, may yet dent its vote in the municipal elections on March 30th. Mr Ozhaseki parrots the government line that the corruption probe is a foreign-inspired plot carried out by Fethullah Gulen, a hard-nosed Muslim preacher and former ally of Mr Erdogan's, who lives in self-imposed exile in rural Pennsylvania and whose disciples have flooded the ranks of the police force and the judiciary under AK's watch.

That does not persuade Memduh Boydak, whose family-run conglomerate, Boydak Holding, is one of the 20 biggest Turkish companies, employing around 16,000 people. Like many "Anatolian tigers" who have thrived under AK rule, Boydak has been hurt by Turkey's sharp economic slowdown, a sudden fall in the lira and a big rise in interest rates. These troubles have been exacerbated by the continuing power struggle between AK and the Gulenists. A clash of views and egos between their leaders has played a big part. "There is a 10% drop in business and there is a problem with corruption," admits Mr Boydak, though he adds that he believes in the country and that the problem will pass.

But few of Mr Erdogan's supporters appear to care so much. "OK, so they steal, but unlike the others [ie, the opposition] they get things done," says Gokhan Baydur, a waiter, gesturing towards Mount Er-ciyes where the municipality recently completed what Mr Ozhaseki insists is a world-class ski resort. "We will win comfortably, no problem," he predicts of the March election.

He is probably right. Yet many believe that AK's share of the vote is likely to drop. This is because Kayseri also has a big base of Gulenist support. The movement runs one university, 16 lycées and 18 crambers in the city. A recent law passed by AK to phase out thousands of crambers across Turkey (two-thirds of these are thought to be Gulen franchises) is designed to deprive the Gulenists of cash and recruits. But that angers thousands of conservative families who praise the quality of the Gulenists' tutoring and their family values. "They are outraged by Erdogan's calumnies against our *hodja* [ie, Mr Gulen] and will no longer vote for AK," a member of the movement claims.

"These elections are a contest between Erdogan and the [Gulen] community," noted Rusen Cakir, an analyst. "Both spring from Islamic traditions and they, therefore, face a difficult task," he added in an interview with the Haberturk news channel. This might explain why the astute Mr Ozhaseki has chosen not to join in Mr Erdogan's rants against the *hodja*. ■



Spain's press

A shrinking order

MADRID

Sacked editors are a sign more of financial than political pressures

JOURNALISTS are supposed to check their facts, but when editors are sacked rumours will do. Some see dark political forces behind the ousting of editors at Spain's three big dailies, *El País*, *El Mundo* and *La Vanguardia*. But the upheaval also reflects a deeper business crisis.

Until last month, Pedro Ramírez had edited *El Mundo* from its birth 25 years ago. Famed for investigations, sharp-tongued columnists and conspiracy theories, it ruffled many feathers. Mr Ramírez blames Mariano Rajoy's ruling Popular Party (PP) for his sacking. The new editor, Casimiro García-Abadillo, points to poor sales, which have halved in five years, and says Mr Ramírez alienated readers loyal to Mr Rajoy who found a feud over PP corruption too personal.

El País's editor, Javier Moreno, also pursued corruption. But he has overseen a fall in circulation and last year sacked almost a third of the staff, damaging morale even as he cut operating losses. *El País* aims to be "the global newspaper" in Spanish; its next editor, Antonio Caño, ran its Latin American website. Mr Caño denies that *El País* will shed its centre-left identity, though he is clearly more conservative than Mr Moreno.

El Mundo vies with *El País* for domination of the Hispanic world's online news audience, but turning that into money is an uphill task, admits a senior executive at *El Mundo*. *La Vanguardia*'s local Catalan subscription base has kept

it mostly profitable. There the choice of Marius Carol as the next editor is being interpreted as a shift from the Catalan nationalist flag-waving of his predecessor, José Antich.

If newspapers are not bending to political pressures, might they bow to more commercial ones? Some journalists admit to self-censorship for fear of annoying big advertisers. *El Mundo* accused Telefónica of cutting advertising after it reported a 2002 insider-trading probe against the firm's chairman, César Alierta, a charge Telefónica denied. Although Telefónica accounts for only a small fraction of advertising—the biggest general advertisers are non-Spanish multinationals like Procter & Gamble and L'Oréal—other channels of influence also exist. Loss-making Prisa, the owner of *El País*, has been repairing its balance-sheet and has won a reprieve from its bankers. But after conversion of a convertible bond, Prisa's banks will own 16% of the shares, more than the founding Polanco family. Telefónica will also have a stake, and hedge funds claim another 17%.

The biggest challenge is more fundamental. Dailies reach just a third of Spaniards. Print-advertising income has fallen by 56% since 2008; digital advertising has not made up for this. Owners want higher paper sales, more advertising and fancy websites, all done with smaller budgets and fewer staff. Battling political pressure is the least of their worries.

Charlemagne | Disarmed diplomacy

Germany needs to do more than work the telephones to resolve the Ukraine crisis



ANGELA MERKEL, like many Germans, views Russia with both suspicion and sentiment. As the first German chancellor from the ex-communist east, she has few illusions about the legacy of the Soviet Union or the nature of Vladimir Putin, an ex-KGB man who served in Dresden. She is more willing than her predecessors to speak out against his human-rights record. Yet she also understands his dismay over the loss of Ukraine. On her desk she has a portrait of Catherine the Great, the German-born princess who became Russia's empress and conquered Crimea.

Such mixed feelings, to which one might add post-war guilt and even pacifism, help to explain the paradox of Germany's reaction to Russia's invasion of Crimea. Mrs Merkel is Europe's most powerful leader, yet her country has so far been the main obstacle to a firm, unified Western response. When America suggested Russia should be thrown out of the G8 rich-country club, Frank-Walter Steinmeier, the German foreign minister, opposed it. When east Europeans wanted to threaten explicit sanctions, he insisted that dialogue should take priority. "Diplomacy is not a sign of weakness. It is more needed than ever."

Social Democrats such as Mr Steinmeier have tended to treat Russia indulgently; his former mentor and chancellor, Gerhard Schröder, even became chairman of the shareholders' committee of Nord Stream, a pipeline consortium dominated by Russia's gas giant, Gazprom. But as European Union leaders prepared for an emergency summit this week, Mrs Merkel did not demur from Mr Steinmeier's views. The need for close relations with Russia is widely understood. Germany's response is best summed up by the front cover of *Tageszeitung*, a daily paper, which ran a picture of a blue telephone with the headline: "Europe's most potent weapon." Diplomats say Mrs Merkel, more than anyone else, has been "at the heart of the web" of diplomatic contacts, calling Mr Putin to try to set up a contact group and deploy international monitors, in the hope that Russia might release its grip on Crimea or at least stay out of eastern Ukraine.

Is Germany's desire to keep talking to Russia born of a genuine belief in diplomacy, or is it cant to protect its commercial interests? Certainly, German business is strongly against any escalation. The Committee on Eastern European Economic Relations, a big-business lobby group, argues that tit-for-tat sanctions would

endanger the jobs of 300,000 Germans dependent on trade with Russia. As a destination for German exports, Russia ranks 11th, behind Poland and just ahead of Spain. Germany has a large (and rare) trade deficit with Russia, which provides about a third of its oil and gas. Still, it would be wrong to accuse Germany of blocking sanctions merely to sell lots of Mercedes to oligarchs.

Germany's rapprochement with Russia dates back to the cold-war *Ostpolitik* pursued by two earlier Social Democratic chancellors, Willy Brandt and Helmut Schmidt. They believed the division of Germany would be ended only by normalising relations with East Germany and the Soviet Union, through a succession of small steps in trade, as well as cultural, personal and political contacts. For the Social Democrats, in particular, *Ostpolitik* was a means of averting a third world war fought on German soil, and of rebalancing Germany's relationship with America. Germans also feel lingering gratitude to the Soviet leadership for allowing reunification and withdrawing troops from the east.

The Germans thus draw different historical lessons to the Americans. For America the cold war was won by decades of military and diplomatic firmness. For Germany, it was as much if not more because of patient diplomatic engagement. The cold-war belief in the power of dialogue, or "change through rapprochement", now applies to dealings with Russia in hopes of promoting democratic change. For many Germans, says Stefan Meister of the European Council on Foreign Relations, peace in Europe can only be secured with Russia, not against it.

How to talk to the bear

Germany's accommodation with Russia creates its own problems, however. First, the offer of partnership for modernisation has patently failed. Mr Putin has become more autocratic, not less, and he has now resorted to military force on the very borders of the EU. Second, by embracing Russia Germany risks upsetting eastern neighbours that are far more exposed to Russian troublemaking. The Baltic states, for one thing, all have large Russian minorities.

Just as Germany wanted central and eastern Europe to join NATO and the EU, so Poland and others want a buffer of friendly, westernising democracies against the Russian bear. Hence their push for an activist policy in the former Soviet republics. In 2008 Germany blocked efforts to grant Ukraine and Georgia NATO candidate status. Poland and Sweden (with Germany's acquiescence) then pursued a new "eastern partnership", designed to bind neighbours into a tight economic, political and free-trade relationship, but stopping short of EU membership. But this too was resisted by Russia ahead of last November's Vilnius summit, provoking first revolution in Kiev and then Russia's invasion of Crimea. To Russophiles, among them Mr Schröder, the crisis is proof that playing tug-of-war with Russia broke Ukraine. To Russiaphobes, it shows the contrary: that it was naive to think Mr Putin would ever be a European democrat.

No country is prepared to risk war with Russia, so all want a diplomatic solution. Mrs Merkel is as well placed as anybody to talk to Mr Putin. But as she works the telephone to the Kremlin, she should ask herself this: is Mr Putin more likely to listen to her if she offers only her friendship, or if she is also armed with an unequivocal commitment by the EU to impose clearly defined sanctions unless Russia stands down its military threat? ■



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Defence strategy

Missing in action

Britain needs a strategy to make the best use of its shrinking military capabilities. It isn't getting one

WHAT kind of armed forces does Britain need? In a dangerous and unpredictable world, how should the country spend its shrinking defence budget? Worryingly, it has put off answering these questions—and time for thinking is short. The next 18 months could determine whether the country remains a global military power or settles for inexorable military decline and growing irrelevance to its French and American allies.

In 2010 a new Conservative-led coalition government took an axe to defence, as it did to much other state spending. The Ministry of Defence's budget was trimmed by 8%. On top of that, the department had to close a £45.6 billion (\$76.2 billion) hole in the equipment budget, which had been mismanaged by the previous, Labour, government. Then the Treasury shifted the costs of running and upgrading Britain's nuclear arsenal to the ministry. All told, the defence budget had to be cut by about a quarter—while Britain was still maintaining a large force in Afghanistan.

Along with this savage pruning came a hopeful vision of the armed forces. By 2020, it was hoped, Britain would have fewer infantry but a bigger, more potent reserve force. Though armoured vehicles and artillery would be cut, the country would have some fine equipment, including two new aircraft carriers and stealthy F-35 fighter jets to fly from them.

What the military establishment did

not do—hardly surprisingly, given the urgent challenge of hacking back the defence budget—was to think seriously about the threats Britain was likely to face and what it could realistically accomplish. A national security strategy, published at the same time as the spending review, boasted that Britain's strategic ambition was in no way diminished by the savaging of the defence budget. This seemed Panglossian at the time and has become more so as the Treasury continues to nibble at spending.

Strategy is not about having a perfect, comprehensive plan—an impossible goal. Rather, it involves working out the likelihood that the country will face various threats, and reshaping the military as far as limited resources allow so that it can adapt to deal with them.

Threats there are aplenty. Since the Arab spring, the arc of instability that is the Middle East and north Africa has worsened, menacing Europe. Meanwhile America is pivoting towards Asia. The Pentagon increasingly expects Europe—meaning mostly Britain and France—to look after security in its own neighbourhood.

Britain is little prepared for this. Like other Western countries, it continues to give too high a priority to fighting a war against a sophisticated adversary—something it is unlikely to have to do, Russia's thuggish behaviour in the Ukraine notwithstanding. Britain gives too low a priority to the dangers posed by failing states

and religious and ethnic struggles across Africa and the Middle East that are far more complex and wide-ranging than simply the export of terrorism.

Cuts to the armed forces have been strategically incoherent. David Cameron, the prime minister, promises to increase funding for military equipment by 1% a year in real terms after 2015. But the deep reductions to the Ministry of Defence's budget, combined with the ever-rising cost of training and equipping a soldier, mean manpower is being slashed. The chief of the defence staff, General Sir Nick Houghton, has warned that Britain could end up with what Americans call a "hollow force"—an exquisitely equipped military that is short of trained men.

The pity of war

The political background is just as troubling. The British public admires its armed forces but seems increasingly reluctant to use them. Engagements in Iraq and Afghanistan have convinced people that interventions abroad are likely to turn into bloody, expensive failures. A vote in the House of Commons last August rejecting British participation in an American-led air strike on Syria reflected that mood. Political leaders have little appetite for trying to persuade the public that capable armed forces are essential to Britain's future.

So there is an urgent need for a serious restatement of national strategy that could create a political consensus and inform Britain's next strategic defence and security review (SDSR), due in 18 months. According to Paul Cornish, professor of strategic studies at Exeter University and an adviser to Sir Nick, this has yet to start. Nor is there much sign of direction from the top.

James Arbuthnot, the Tory chairman of the Commons defence committee, worries about government foot-dragging on the ►►

national security strategy. He says there is a "crisis of misunderstanding" about the value of the armed forces to the country. Mr Arbuthnot's committee has urged the government to publish the new national security strategy well in advance of the SDSR. But Philip Hammond, the defence secretary, warns of the dangers of setting strategy without knowing how much money will be available to carry it through.

That points to another problem: political timing. The general election is scheduled for May 2015; the SDSR should be published five months later in October. Any work undertaken now will have to be finished off by a new government which might not feel bound by its predecessor's decisions. Yet if the review does not start soon, it will be rushed and more likely to reach ill-considered conclusions.

The big problem, says Sir Hew Strachan, professor of the history of war at Oxford University, is that Westminster and Whitehall do not think strategically. Following the attack on the World Trade Centre in 2001, the concentration on terrorism as the principal existential threat facing the nation robbed British defence policy of coherence and credibility.

The solution should have been the national security council, established in 2010, which now has a secretariat of about 200 people sitting in the Cabinet Office. It is led by a national security adviser, Sir Kim Darroch, a foreign office mandarin. But critics say he and his team default to a civil service mentality that tends to be tactical rather than strategic.

Sir Hew argues the national security council has been a disappointment. In a recent book, "The Direction of War", he argues that it fails to tackle crucial issues like the restructuring of the British army, and "prioritises the short-term and operational over the long-term and strategic." Its secretariat lacks military expertise. Andrew Dorman, professor of international security at King's College London, thinks the national security adviser should be a big-hitting political figure with cabinet rank rather than a civil servant, even though departmental ministers might not like it.

For now the process seems rudderless. When Mr Cameron was asked a few weeks ago who would be in charge of the strategy review, the man known as the "essay-crisis prime minister" for his tendency to take decisions at the last minute said that he would lead it. But he has shown no inclination to start the process.

With its geography, history and open economy, Britain knows that its prosperity and security depend on the rules-based international order and being willing to uphold it when it is threatened. The 2015 SDSR is an opportunity to bring together the elements required for a modern national strategy to do this. As things stand, it seems likely to be squandered. ■

Gangster memoirs

Gift of the grab

The boom in British gangster literature may be coming to an end

EVERYBODY has a book in them, but former criminals seem to have more than most. In January the second autobiography from Charlie Richardson, the self-proclaimed "hardest man in south London", who died in 2012, was released. "The Last Gangster: My Final Confession" has been among the top ten non-fiction hardback books in the *Sunday Times* bestseller list for the past six weeks. Its success hints at a broader thirst for a particular 1960s criminal vintage.

In May Bobby Cummines, a friend of Richardson's and a former bank robber, will bring out his autobiography, "I Am Not A Gangster". A tide of books about the Kray twins—the Richardsons' more famous, less accomplished criminal rivals—describe the thuggery of the London "faces". Meanwhile authors like Kimberley Chambers and Martina Cole set many of their novels in the murky East End underworld of five decades ago.

This obsession started in the early 1990s, remembers Dick Hobbs, a criminologist at the University of Essex. A new crop of blokeish magazines began to run features on sharp-suited career criminals, whose style they emulated in their fashion pages. Documentaries followed: many London mobsters had just been released from prison and were keen to chat.

Today, gangster tales offer a break from

worries about the economy, social mobility and immigration. Unemployment was low in the 1960s. London's docks provided huge numbers of well-paid working-class jobs, as well as lots of stuff to steal. East London was still overwhelmingly white. Gangsters amassed their (usually modest) riches without the aid of family wealth or education: Richardson makes much of his "natural intelligence".

However falsely, gangsters are associated with that more stable era and even held to be responsible for it. "In the old days you could leave your door open," says Ms Chambers, who writes stories about men who use pliers to remove people's teeth before setting them on fire.

Unsurprisingly, biographies cast the villains in a benign light. Mr Hobbs, who has read lots of them, spies the influence of probation officers on the stories, which often include accounts of childhood privations. "These books were born in prison," he says. Ms Coles's fiction is populated by tough men with "thick dark hair, dark-blue eyes and a Roman nose that somehow looked good on him personally". Women are keen readers of the genre.

Still, the boom may end soon. Many 1960s gangsters are dead. A small publishing house that specialised in memoirs by hooligans and criminals has gone quiet. And modern serious crime is largely colourless. It involves drug importation rather than extortion or armed robbery and is international, not local. Its practitioners have good contacts and business judgment, but not flair. They do not hobnob with celebrities in West End clubs. Unlike Richardson and his contemporaries, modern serious criminals are unlikely to capture the public imagination. They are also rather less likely to be caught. ■



Too little space

"Gravity", a thriller set in orbit but filmed in west London, won seven Oscars on March 2nd. Yet Pinewood Studios, in whose buildings the movie was shot, is running out of space. In May officials refused the firm permission to double the size of its main facility, which sits in London's green belt (it is appealing). Tax breaks and talented techies—Gravity's visual magic was performed by Framestore—are driving growth in Britain's film industry, which earned £1 billion in 2013. But cramped Pinewood is having to turn away work. In future, fictional astronauts might find somewhere else to hang around.

Bagehot | A great place to be a spy

British spies are bruised by Edward Snowden, trusted by the public and need better oversight



INSIDE the vast, doughnut-shaped hideaway of GCHQ, Britain's signal-intelligence agency, the spies are sweating. In a sense, it turns out that they always are. Revelations from Edward Snowden's stolen computer files suggest life at their Cheltenham base includes lots of healthy activities, including yachting and an annual sports day. There are also clubs for ghost-hunting, chess and gays and, naturally, a puzzle sheet for the spooks to crack over breakfast, entitled *Kryptos*.

Yet Mr Snowden's revelations have caused additional perspiration in the doughnut, because they have been deeply compromising. Reports published by the *Guardian* and elsewhere have made public the vast extent to which GCHQ and its American counterpart, the National Security Agency (NSA), scoop up and store data, including e-mails and telephone calls from millions of unsuspecting Britons. They have also caused embarrassment with other allies, for example by revealing that GCHQ was bugging the South African foreign ministry. Most worrying for the spooks, Snowden's acolytes could yet blow the cover of thousands of operatives, methods and operations which have not been made public but, given that the stolen trove included 58,000 GCHQ documents, easily could be. Merely identifying those secrets is costing GCHQ innumerable geek hours.

But in the crucial matter of public trust Britain's spooks have not suffered. The contrast with America, where a combination of political unease and public pressure—especially from Silicon Valley—spurred Barack Obama to order reviews and reforms, is striking. There has been no public protest and remarkably little coverage of the Snowden revelations outside the *Guardian*, whose circulation has continued to slide. There has been no parliamentary debate of the debacle. Until this week, when leaders from the coalition government's junior faction, the Liberal Democrats, and the opposition Labour Party both called for Snowden-inspired reforms, there had been little political discussion of it. Other countries, especially European ones, are at once outraged at learning that British spooks snooped on them and baffled that Britons don't seem to mind having been spied on themselves. "I've had German and Japanese journalists on the phone asking, 'Why isn't there uproar?'" says Nick Pickles of Big Brother Watch, a civil liberties outfit.

It is not because Britons don't care about privacy. They care a great deal, which is why several recent efforts to toughen or clarify data and privacy laws have failed. The answer lies partly in the indeterminate nature of the British constitution. In America, the Snowden scandal became an argument for the preeminent, constitutionally-enshrined right to personal freedom; in Britain, this liberty is less trumpeted. Yet the main explanation is that, in so far as they have an opinion on the matter, Britons trust their spooks.

This is illustrated by the bigger brouhaha that attended a failed government bid to grant the police access to Britons' personal details. It turns out, to the concern of relatively few Britons, that GCHQ already has that capability: it is permitted to access domestic communications routed outside the country, as e-mails and mobile-phone calls often are. There is a difference between cops and spies, of course. Signal intelligence, unlike police evidence, is gathered to protect society against terrorism and other large threats, not prosecute individuals. It is also true that making a big change, such as granting new powers to the police, is harder than acknowledging a status quo that affects few people. Nonetheless, GCHQ's data-scooping could be considered outrageous. It is clearly against the spirit, though not the letter, of one of the main laws binding the agency, the 2000 Regulation of Investigatory Powers Act, which forbids the tapping of British phones without special approval. The *Guardian's* editor, Alan Rusbridger, describes this anomaly as fitting "digital spying" to an "analogue law".

Britons may be contented to give their spies a long leash partly because they have more experience of terrorism than most. Some also argue that the spies have earned their good reputation. "Say intelligence to an American and he thinks Iran Contra and Pearl Harbour. We think of Bletchley Park," says an admiring official. That takes no account of their blunders. All the same, the *Guardian* has uncovered no example of GCHQ acting illegally. There is no evidence, for example, of GCHQ obtaining intelligence from the NSA that it cannot collect because of legal constraints. Those who know the agency describe a profoundly rule-abiding culture, as one might expect from an establishment that sounds like a cross between Butlins and "Nineteen Eighty-Four".

Stir, don't shake up

The most important reason for Britons' spy-love concerns the broader benignity—at least at home—of the British state. It has not necessitated an urgent framing of individual rights against oppression—such as America's constitution was, in response to colonial rule. It has not created horrors such as the German Gestapo or Japanese Tokko. That is good, but ground for complacency, which is why the Lib Dems' and Labour's move was overdue.

The parties' proposals are much the same. Both want to update RIPA and beef up the instruments of oversight: two commissioners, who rule on the legality of spy operations, and Parliament's Intelligence and Security Committee (ISC), which takes a broader view. The latter has already been toughened under the coalition—yet it is too supine or, given tight controls on its selection and powers, unable to avoid giving that impression. The parties suggest it should be headed by an opposition MP and otherwise become more like a regular parliamentary committee.

This is well-judged, being modest yet pointing to both modernity and the light. The argument against introducing a bit more transparency into the intelligence world was that it could let Britain's enemies know they were under scrutiny. But that had always a ring of apologetics. Post-Snowden, it is also out of date. ■



Pope Francis's first year

Faith, hope—and how much change?

VATICAN CITY

How a modest but canny man is approaching the complex task of leading the Roman Catholic church

IN THE 12 months since he appeared on the balcony of St Peter's to begin his papacy with a disarmingly unaffected "Good evening" to the crowd below, Pope Francis has won a following far beyond the Roman Catholic church. He has softened the image of an institution that had seemed forbidding during the reign of his predecessor, Benedict, and shown that a pope can hold thoroughly modern views on atheism ("The issue for those who do not believe in God is to obey their conscience"), homosexuality ("If a person is gay and seeks God and has goodwill, who am I to judge?") and single mothers (he has accused priests who refuse to baptise their children of having a "sick mentality").

More than anything, Francis has demonstrated an extraordinary ability to communicate his ideas, and those of his faith, purely by gesture. Every recent pope has spoken of the need to treasure human life, even in its most tragic and painful manifestations. But Francis achieved more than any of them when he embraced a sufferer of neurofibromatosis, a disfiguring genetic disease. Though all popes pay lip service to the need for humility and simplicity, Benedict departed from the Apostolic Palace after his unexpected resignation in Febru-

ary 2013 in a Mercedes limousine. Francis drives a 1984 Renault of the sort owned by many French farm labourers.

A poll published by the Pew Research Centre on March 6th found that, in America, two-thirds of Catholics and half of non-Catholics regard the new pope as a change for the better. But whether he is attracting lapsed Catholics to return to regular observance is unclear. In a poll of Italian priests last year, more than half reported increases in church attendance. But Pew found no significant change in how often American Catholics said they went to Mass.

The task ahead is daunting. High birth rates in the developing world mean the number of baptised Catholics, around 1.2 billion, continues to grow. But there is an ever-widening gap between the doctrines of the church with regard to sex and marriage and what Catholics, particularly in the developed world, think and do. Clerical sex-abuse scandals, and the church's complacent response, have also seen many Catholics in western Europe and North America turn away in disgust. A fear sometimes voiced privately in the Vatican is that Catholicism risks one day becoming a religion largely for Africans and Asians, confined elsewhere to a self-consciously

reactionary fringe. Much therefore depends on this frugal, likeable man.

As the first Latin American pope, Francis has a political and economic perspective quite unlike that of his predecessors—in particular the two most recent, Benedict XVI and John Paul II, both Europeans whose attitudes and thinking were shaped by the cold war. Diplomats listening to his annual "state of the world" address in January noted with interest, even astonishment, that Europe was barely mentioned beyond its role as a destination for poor migrants.

Pope Leo XIII's encyclical *De Rerum Novarum* ("The Rights and Duties of Capital and Labour"), which first set out Catholic social teaching in 1891, was as critical of the excesses of capitalism as it was of socialism. "To misuse men as though they were things in the pursuit of gain, or to value them solely for their physical powers—that is truly shameful and inhuman," he wrote. But since then Catholic leaders have become more tolerant of capitalism. One reason was their perception that Marxism, which is inherently atheistic, was the greater Satan. Another was the dominance of Italians within the hierarchy: tempered by Christian Democracy, which ostensibly advocated Catholic social teachings, capitalism had created Italy's post-war "economic miracle". Right-wingers also supported the church on matters such as abortion. Perhaps most important, from a European viewpoint capitalism was the only feasible alternative to communism.

By contrast, says Jimmy Burns, a former correspondent in Argentina who is writing a biography of Francis, the pope "tends to ►►

▶ see capitalism in terms of its effects on the third world". The form of capitalism he knows from Latin America is, for the most part, not liberal, but corrupt and crony-ridden. His disdain for it radiates from his first Apostolic Exhortation, *Evangelii Gaudium* ("The Joy of the Gospel"): "Today everything comes under the laws of competition and the survival of the fittest, where the powerful feed upon the powerless."

As archbishop of Buenos Aires, Francis supported the city's *cartoneros* (wastepickers) as they fought for better working conditions. Last year he arranged for an organiser of the *cartoneros*, Juan Grabois, to attend a Vatican-sponsored workshop on the "Emergency of the Socially Excluded". Mr Grabois, who describes himself as a "social militant against the havoc the neoliberal model caused in the 1990s", told the meeting how impressive he found the "radicalism" of *Evangelii Gaudium*. During Benedict's reign it is unlikely that anyone like him would have been let inside the Vatican's gates.

Francis's views pose difficulties for conservatives inside and outside the church. One passage in *Evangelii Gaudium* appalled many: "Just as the commandment: 'Thou shalt not kill,' sets a clear limit in order to safeguard the value of human life, today we also have to say 'Thou shalt not,' to an economy of exclusion and inequality." Even more radically, he quoted St John Chrysostom, an early church father: "Not to share one's wealth with the poor is to steal from them."

Rush Limbaugh, a conservative American radio talk-show host, called *Evangelii Gaudium* "just pure Marxism". Francis brushed that claim aside, but in a way that did little to mollify his critics. "The Marxist ideology is mistaken," he said in an interview with *La Stampa*, an Italian daily. "But I have known many Marxists in my life [who have been] good as people and because of that I do not feel offended."

The Peronist pope?

The political landscape of Francis's homeland, however, offers a more accurate, and nuanced, understanding of his views. For most of his life Argentina has plotted a kind of third way between Marxism and liberalism—albeit one with disastrous political and economic results. "[Francis] only knows one style of politics," says a diplomat accredited to the Holy See. "And that is Peronism."

The creed bequeathed by Argentina's former dictator, General Juan Perón, with its "three flags" of social justice, economic independence and political sovereignty, has been endlessly reinterpreted since. Conservatives and revolutionaries alike have been proud to call themselves Peronist. But at its heart it is corporatist, assigning to the state the job of resolving conflicts between interest groups, including work-

ers and employers. In that respect it resembles fascism and Nazism—and also Catholic social doctrine.

The pope's Peronist side shows in his use of a classic populist technique: going over the heads of the elite to the people with headline-grabbing gestures and comments. And it is visible in his view of political economy, which also has much in common with post-Marxist protest movements such as Occupy Wall Street, the Spanish *indignados* and Italy's Five Star Movement. "While the earnings of a minority are growing exponentially, so too is the gap separating the majority from the prosperity enjoyed by the happy few," he has written. "This imbalance is the result



The new papemobile

of ideologies which defend the absolute autonomy of the marketplace and financial speculation. Consequently, they reject the right of states, charged with vigilance for the common good, to exercise any form of control."

Francis was elected after a clash in the General Congregations, the discussions before a conclave in which the cardinals debate the issues that will face the new pope. A faction composed largely of English- and German-speaking pastoral cardinals made clear their exasperation with what they depicted as the arrogance, secretiveness and mismanagement of the "Italians", a group of insiders, most of them Italian by birth or officials in the Roman Curia, the Vatican bureaucracy, which is steeped in a very Italian ethos of reciprocal favours, patronage and conspiracy. Though his spirituality and managerial talent counted, Francis, an archdiocesan cardinal and the son of Italian emigrant parents, was also the embodiment of a compromise between the two factions.

His first, and possibly most important,

decision after taking office was to shun the papal apartments in the Apostolic Palace overlooking St Peter's Square for simpler accommodation: Room 201 of Casa Santa Marta, a sort of hotel within the Vatican for visiting clerics and others. He has explained this decision in terms of his need as a member of a religious community, the Jesuits, not to live in isolation. But it was also a shrewd political move. It expressed his desire to eschew ostentation and to seek counsel from outside the church's traditional power structures: living in Casa Santa Marta gives him the freedom to buttonhole all and sundry as they pass through Rome. As he told *Civiltà Cattolica*, a Jesuit periodical, the Apostolic Palace is "like an inverted funnel. It is big and spacious, but the entrance is really tight."

The move signalled the start of what Massimo Franco, a columnist at *Corriere della Sera*, an Italian daily, called "an inexorable transition that has caught many of the 'Italians' off-guard." Since then the pope has bypassed the Vatican hierarchy and placed advisers from the periphery at the centre of his decision-making. A month after his election he created a group of eight cardinals to "advise him on the government of the universal church" and to draw up a project for the reform of the Curia. Only one is a Vatican official. He has also named clerics and laypeople from outside Rome to several other new consultative bodies. Asked to identify Francis's most salient characteristic, one diplomat replied: "His hardness".

Last month Francis announced a new Secretariat of the Economy to oversee the Vatican's financial affairs. This may be the most important change to the Curia since a restructuring ordered by Pope Paul VI in 1967. Its first head will be the archbishop of Sydney, George Pell, whose reputation for ruthlessness has earned him the nickname "Pell Pot" in Australia. Among his many difficult tasks will be to clean up the Institute for the Works of Religion, often known as the Vatican Bank.

Such reforms are essential to the success of Francis's papacy: the Vatican Bank has been at the centre of several financial scandals that have embarrassed recent popes. But they are also dangerous: many in Rome believe that a Curial plot forced Benedict's resignation. When, on January 26th, a crow attacked doves of peace released by children standing beside Francis, some Romans took it as a warning that he risked a similar fate. The insiders whose leaks alleging corrupt favouritism in the Vatican undermined Benedict's papacy were branded *corvi* ("crows") in many Italian media outlets. Francis is aware of these risks. The founder of *La Repubblica*, Eugenio Scalfari, who had a long conversation with him last year, quoted him afterwards as describing the court that forms around a pontiff as a "leprosy of the papacy".

► A misstep in his handling of the long-running scandal of clerical sex abuse poses other, perhaps greater, dangers. On this, critics accuse the pope of moving too slowly. He has set up a special commission for the protection of minors, but its role is merely advisory. Though he suspended Franz-Peter Tebartz-van Elst, a German bishop, for his opulent lifestyle, he has so far done nothing about Robert Finn, an American bishop convicted in 2012 for failing to tell the authorities about a priest suspected of sexually abusing children.

"He has changed the topic from abuse without doing anything about it," says Anne Barrett Doyle of the American watchdog group bishopaccountability.org. "I would never have predicted that a whole year would go by without the new pope reaching out in a meaningful way to the victims." In his most recent interview, with *Corriere della Sera*, Francis appeared to suggest that the church was the true victim: it was "perhaps the only public institution to have acted with transparency and responsibility...And yet the church is the only one to have been attacked."

The flock and the fold

Though structural and organisational reforms mattered, Francis insisted in his wide-ranging interview with *Civiltà Cattolica*, they could only come after what he termed a "reform of attitude". The ministers of the gospel "must be people who can warm the hearts of the people," he said. It was a reminder that the pope is not only the head of a giant multinational, but also a man of faith, who spends two hours every morning in prayer and one every evening in adoration of the Eucharist.

Francis's priority will be, as Benedict's was, to reverse the galloping secularisation of the world's Catholics. This is spreading from western Europe and North America to Latin America, and is, in many cases, rooted in disagreement with the church's teaching on sex. Here, too, he has turned to outsiders for counsel, arranging a global poll of deaneries and parishes to find out how they deal with the family.

"[Francis] is not a dogmatic scholar who would just like to affirm everything as it was in the textbooks," says Hans Küng, a liberal Swiss theologian who has clashed with successive popes over doctrine. And on occasion Francis has hinted at a readiness for change. "Let us think of when slavery was accepted or the death penalty was allowed without any problem," he said to *Civiltà Cattolica*. "Exegetes and theologians help the church to mature in her own judgment."

But it is not yet clear just how far Francis is prepared to go to adapt church teaching to modern life. The gulf that has opened up between the beliefs and attitudes of the Vatican, and those of the faithful, was highlighted by a recent poll in selected coun-

tries commissioned by Univision, an American Spanish-language television network. On a wide range of issues, the only continents on which most Catholics agreed with the Vatican's line were Africa and Asia.

On the subject of artificial contraception, lay sentiment was heavily in favour of change, even in the otherwise dutiful Philippines. A majority supported an end to priestly celibacy in three of the four Latin American countries surveyed, and the ordination of women in two. Throughout Latin America and in Europe clear majorities favoured allowing the termination of pregnancies in some circumstances. And gay marriage, though widely opposed by Catholics in most of the world, was supported by most of the respondents in the United States.

The issue where the well-informed see greatest hope for change is the church's ban on communion for divorced, remarried Catholics. Univision's survey found overwhelming majorities in favour of ending it, not only in Europe and North America, but in Latin America, too. Conservatives raise two objections: one theological and one pragmatic. How can someone in what the church sees as an invalid marriage be a worthy recipient of the Eucharist, which Catholics believe is the body of Christ? And how can the Vatican appear to undermine marriage at a time when the church is engaged in what it sees as a desperate battle to defend the institution against same-sex marriage in many countries, and rising divorce and cohabitation rates almost everywhere?

In recent weeks Pope Francis has nevertheless appeared to be edging towards a shift. Last month he chose Cardinal Walter Kasper, a liberal who has argued against the ban, to address cardinals meeting to discuss questions about the family. And on

February 28th, during his daily mass in Casa Santa Marta, he called on priests to "accompany" those whose marriages had failed. "Do not condemn," he said. "Walk with them and don't practise casuistry on their situation."

Liberal Catholics are also hoping that the pope will reconsider the role of women in the church. "For me, this is the litmus test," says a former senior Vatican official. "If he does not do something radical for women, then I think we can assume he will not make any substantial reforms." One possibility is that he might place a woman, perhaps the head of a religious order, in charge of a Vatican department. Some theologians have argued that only the ordained can exercise power in the name of the pope. But on March 3rd Cardinal Kasper, perhaps acting as a stalking horse, said there was no reason why women could not run some of the Pontifical Councils, second-class Vatican "ministries", which have briefs that include the laity, the family, culture and the media.

Almost no one familiar with the church expects Francis to change doctrine on abortion, divorce or artificial contraception. Many of his non-Catholic admirers seem unaware of his doctrinal limitations. But Mr Küng warns against underestimating the role of style and gestures. His latest book is called, "Can we Save the Catholic Church?" and he answers his own question by noting that Francis has already started to save the church. "It is not only that he has plans," Mr Küng says. "I think that the simple clothing, the change in protocol and the completely different tone of voice are not superficial things. He has, in fact, introduced a paradigm shift. That is the beginning of saving, not the end. But that is already a lot." Perhaps the greatest risk for this unpretentious, popular pope is of raising false expectations. ■



Complex man, complex problems

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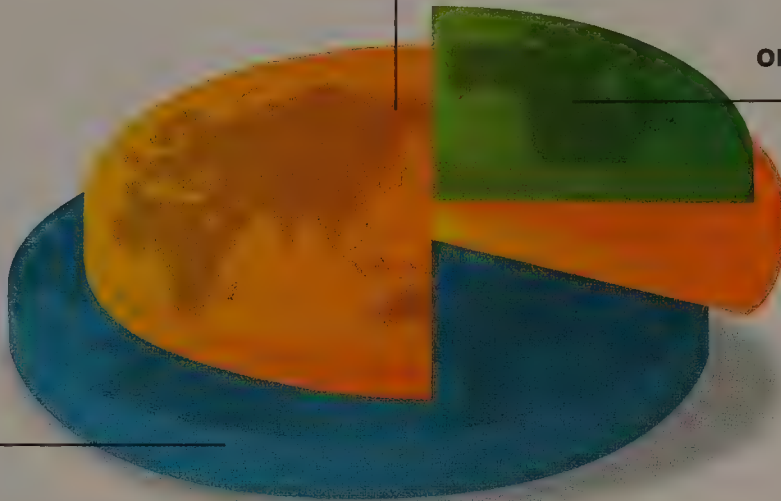
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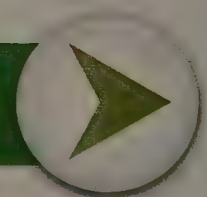
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¹Source: MSCI All Country benchmark returns 1983–2013.

²Source: Gross domestic product based on purchasing-power parity (PPP) share of world total. IMF, Haver Analytics.

³Source: FactSet as of 11/30/2013. Data presented for the MSCI AC World Index, which represents 44 countries and contains 2,436 stocks. The index is not intended to represent the entire global universe of tradable securities.

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Business in emerging markets

Emerge, splurge, purge

Western firms have piled into emerging markets in the past 20 years. Now comes the reckoning

VODAFONE'S latest figures appear at first glance to vindicate the most powerful management idea of the past two decades: that firms should expand in fast-growing emerging economies. Sales at the mobile-phone company fell in the rich world while those in the developing world rose smartly. Corporate strategy is usually a contentious subject: there are fierce debates about how big, diversified and financially leveraged firms should be. But geography has seduced everyone. Vodafone is one of countless Western companies that have bet on the developing world.

Look closer, however, and those figures contradict accepted wisdom. At market exchange rates Vodafone's sales in the emerging world fell, reflecting the widespread currency depreciations in mid-2013, when America's Federal Reserve signalled it would taper its bond purchases. This drag may linger: in January the lira and rand tumbled in Turkey and South Africa, two bigish markets for Vodafone. On longer-term measures things look cloudy, too. Over a decade Vodafone has invested more than \$25 billion in Turkey and India. These operations made a paltry 1% return on capital last year. Vodafone has created a lot of value for its shareholders—but through its American investments, which it has sold to Verizon for a stonking price.

This year Western firms' giant bet on the emerging world will come under more scrutiny. Most multinationals are far more

profitable in emerging markets than Vodafone. American firms made a 12% return on equity in 2012, roughly in line with their global average. But having grown fast, profits are now falling in dollar terms. There has been a long bout of share-price underperformance as investors have lost their euphoria. An index run by Stoxx, a data firm, of Western firms with high emerging-market exposures has lagged the broader S&P 500 index by about 40% over three years (see chart 1). And the recovery in the rich world will mean there will be more competition for resources within firms.

All this will bring strategic questions into sharp relief. Divisional chiefs from Brazil or Asia will no longer get a blank cheque from their boards. Although the

Overexposed?

Stockmarket index performance
\$ terms, March 2007=100



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average company has prospered, there have been disasters; plenty of firms and some whole industries need a rethink. The emerging-market rush may end up like a giant version of the first internet boom 15 years ago. The broad thrust was right but some big mistakes were made.

The companies suffering a slowdown in profits come in three buckets. Consumer firms including Coca-Cola, Nestlé, Unilever and Procter & Gamble have suffered a gentle weakening in demand and a currency drag. Most are still upbeat about the long term, says Andrew Wood of Sanford C. Bernstein, an analysis firm.

Companies in the second bucket face a sharper slowdown. They are in cyclical and capital-intensive industries. Fiat Chrysler's profits in Latin America, a vital cash cow, halved in 2013. This week Volkswagen and Renault joined the ranks of Western carmakers warning of weak emerging-market sales. Last month Peugeot wrote off \$1.6 billion of assets, mainly in Russia and Latin America. Emerging-market sales have fallen at Cisco, a technology firm; its boss, John Chambers, reckons it is "the canary in the coal mine". Industrial giants such as ABB and Alstom have seen orders falter for infrastructure projects, for example the building of power stations, says Andreas Willi of J.P. Morgan.

Those firms with mismatches—costs or debts in firm currencies but sales in depreciating ones—face a nasty squeeze. Margins in emerging markets have halved at Electrolux, which makes fridges and other appliances. Codere, a Spanish firm with an empire of gaming and betting shops in Latin America paid for with debts in euros, is now on life support and restructuring its balance-sheet.

In the third bucket are firms with idiosyncratic problems. China's war on graft has hurt luxury-product makers that have

grown fat by selling bling to the Middle Kingdom. Sales at Rémy Cointreau, which makes cognac that Communist Party bigshots quaff, fell by a fifth in the quarter to December, compared with the previous year. Russia's once-frothy beer market is shrinking as the country conducts one of its periodic crackdowns on alcoholism.

All this may be breezily dismissed as short-term turbulence. But emerging-market wobbles can have a profound impact on corporate strategy. After the 1997-98 Asian crisis many multinationals tilted back towards the rich world. Citigroup and HSBC, two big banks, played down their Asian heritages and spent the next decade building subprime and investment-banking operations in America. Unilever's operating profits fell in 1997. It felt obliged to tell shareholders that the rich world was its "backbone" and by 2000 it too had made a huge American acquisition, of Bestfoods.

Rising exposure

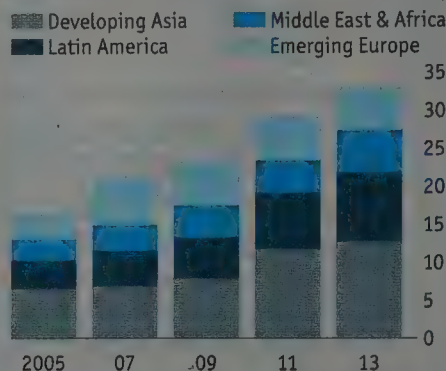
The emerging world's troubles are not as bad as in 1997-98. But the exposure of rich-world firms is far higher than then (see chart 2). Big European firms make one-third of their sales in the developing world, almost triple the level in 1997, reckons Graham Secker of Morgan Stanley. For big, listed American companies the total has doubled, to about one-fifth. For Japanese firms it is about one-tenth, says Kathy Matsui of Goldman Sachs. The bigger a firm is, the greater its exposure tends to be. Rich-world firms do business across the emerging world, with China accounting for 10-20% of it. Consumer goods, cars, natural resources and technology are the industries with most exposure. Property, construction and health care have the least.

Many of these operations pre-date the boom. European firms have footprints in Asia and Africa from colonial times. American firms dominated foreign direct investment (FDI) flows in the 1970s and 1980s. By the 1990s manufacturing firms were creating global production chains. A wave of privatisations in Latin America enticed a new generation of *conquistadores* from Iberia and North America.

But by the mid-2000s the process had accelerated dramatically as executives and boards latched on to the idea of the fast-growing BRICS (Brazil, Russia, India, China) and their ilk. Once the subprime and euro crises began, the urge to escape the Western world was irresistible. FDI into China in 2010 was more than double the level in 1998. Takeovers became common. In 2007 purchases in emerging markets by rich-world firms reached \$225 billion. That was five times the level just half a decade earlier. One measure of how discipline slipped is the valuation of those deals. In 2007 rich-world buyers stumped up a dizzy 17 times operating profits for their targets, double the multiple paid in 2000-03.

Emerging and surging

European firms' emerging-market sales by region
As % of total sales



Source: Morgan Stanley

Some firms had unexpected identity changes. Suzuki, a Japanese carmaker, found that its formerly sleepy Indian arm accounted for the biggest chunk of its market value. Portugal Telecom's Brazilian unit kept it afloat during the euro crisis. Having taken control of a beer firm in St Petersburg, Carlsberg, a Danish brewer, became a "Russia play". Mandom, an 87-year-old Japanese firm, found itself a giant of the Indonesian male-cosmetics market.

Other firms' efforts to peacock their emerging-market credentials look, with hindsight, like indicators of excess. Having been bailed out for its toxic credit exposures back in America, Citigroup rebranded itself as an emerging-market bank. Schneider Electric, a French engineering firm, and HSBC relocated their chief executives from Europe to Hong Kong (HSBC has since backtracked).

Historians may judge the peak of the frenzy to have been in June 2010. Nathaniel Rothschild, a scion of a banking dynasty (some of whose members are minority

shareholders in *The Economist*), raised \$1.1 billion for a shell company in London, set up to buy emerging-market mining assets. Months later it invested in Indonesian coal mines with the Bakrie family, known in that country for its political ties and web of businesses. According to Bloomberg, Mr Rothschild shook hands on the deal without visiting the main mine in question, in Borneo. The transaction was a "terrible mistake", he later admitted.

Every corporate-investment cycle creates triumphs and disasters, and a lot of mediocrity. The emerging-markets boom will be no exception. Hard figures are elusive but the book value of the equity that Western firms have invested in the emerging world has probably risen by at least \$3 trillion since 1998. This is a colossal sum, equivalent to 11% of the emerging markets' combined GDP in 2013. Many firms have prospered, such as the banks that braved Mexico in the 1990s. But there is plenty of rot, too.

Start with takeovers. There have been \$1.6 trillion-worth since 2002. A rule of thumb is that half of all deals destroy value for the acquirer. Like Vodafone, many firms paid dizzy prices justified by pepped-up forecasts. In 2010 Abbott Laboratories, an American drugs firm, paid \$4 billion for the small Indian drugs unit of Piramal, predicting it would grow at 20% a year for a decade. Two years later sales were stagnant in dollar terms. Daiichi Sankyo, a Japanese drugs firm, has been badly burned in India, as the company it bought into, Ranbaxy, has hit serious quality problems. Lafarge paid \$15 billion for Orascom, a North African and Middle Eastern rival, in 2007. The French cement giant predicted sales would rise by 30% a year. Since then its shares have almost halved, partly due to the crippling debt burden incurred.

Big greenfield projects have broken hearts, too. ThyssenKrupp, a German steel colossus, launched an ambitious project in 2006 to make steel slabs in Brazil and process them in America. Rising costs have made it unviable, and most of the \$10 billion sunk has been written off. The firm's boss has labelled the episode a "disaster". Anglo American, a mining company, buried \$8 billion and the career of its former chief executive, Cynthia Carroll, in a Brazilian project called Minas-Rio. Cost overruns have led to a \$4 billion write-off.

Besides such eye-catching failures, there are pockets of serious under-performance tucked away in corners of sprawling multinationals. Consumer-goods firms have made hay in emerging markets, but even the best have some iffy businesses. Procter & Gamble's margins outside America are half those it enjoys at home. Profits are weak in India and Brazil, where it is a laggard. A.G. Lafley, who returned as the firm's boss last year, has promised more discipline.



Faded prospects in China

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► It is the same story with Spanish investments in Latin America. Telefónica makes good money across most of the continent, says Bosco Ojeda of UBS, a bank. But Mexico is a running sore. For 14 years Telefónica has poured in billions of dollars without threatening Carlos Slim, who dominates telecoms there. Even the world's two biggest brewers, Anheuser-Busch InBev and SABMiller, which have been huge successes, have bought some businesses with low market shares and commensurately weaker profits and returns on capital.

In some cases the underperformance is spread across an entire industry. During a boom every firm thinks it can be a winner, leading to excess investment and saturation. The more capital-intensive the industry is, the greater the pain in store for its weakest members. Insurance is a case in point. India has more than 20 foreign firms slugging it out for tiny market shares while bleeding cash. Turkey is also an insurers' graveyard. Most European firms have a motley collection of emerging-market assets, but only a few, such as Prudential, AXA and Allianz, have scale. "There are trophy markets where everyone has decided they have to be in. Typically they don't make a lot of money," says an executive.

The car industry also has a long tail of flaky businesses. It has invested more than \$50 billion in factories in China, with great success, reckons Max Warburton, also of Bernstein. But "China has affected the judgment of a lot of chief executives," making them too bullish about other emerging markets. More than \$30 billion has been invested in developing countries other than China. New factories are opening just as demand has slowed. Ford's number two, Mark Fields, this week expressed worries about excess carmaking capacity building up in Brazil, Russia and India. Mr Warburton thinks such operations could burn billions of dollars this year. "Everyone is bracing to lose a lot of money."

Taking the beer goggles off

Some rich-world firms need to take a long, cold look at their emerging-market businesses and work out if they make sense. But there are psychological barriers to this. One is that most Western businesses have low gearing—usually it is only when they have a debt problem that they make difficult decisions quickly. Without their emerging-markets pep pill many firms would have dire revenue growth. The developing world has supplied 60-90% of the growth of Europe's big firms in recent years. And a whole generation of chief executives has learned that quitting emerging markets is a mug's game. Bosses who panicked and left after the 1997-98 crisis ended up looking like idiots.

Yet companies should allocate capital carefully, regardless of the spare funds they have. Sales growth without profits is point-

less. And comparisons with 1997-98 are imperfect. Most industries have become more competitive, as emerging economies' local firms get into their stride. The low-hanging fruit is gone. Reflecting this logic, a few big industries have already begun to trim their emerging-markets arms.

Exhibit one is banking. After being bailed out, some firms such as ING and Royal Bank of Scotland have largely retreated from the developing world. Bank of America has sold out of its Chinese affiliate. But even big, successful firms which are dedicated to emerging economies are trying to boost returns by trimming back. HSBC has got out of 23 emerging-market businesses. The world's biggest five mining firms are also adapting to lower emerging-market demand. They have cut capital investment by a quarter since 2012, says Myles Allsop of UBS.

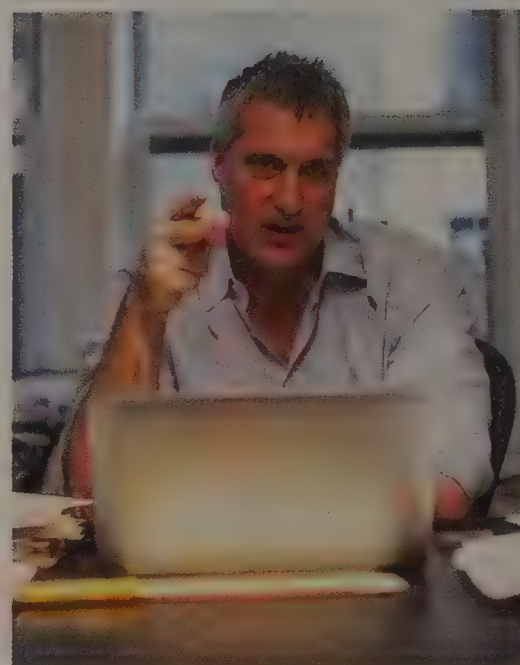
The supermarkets are in retreat after decades of empire-building that led them to invest \$50 billion in the emerging world. Synergies have proved elusive, local rivals have got stronger and tastes more particular. In Turkey shoppers prefer discount stores to hypermarkets—the four biggest foreign firms there lost money in 2012. Aside from Walmart's Mexican unit, most rich-country grocers' operations in the developing world have low market shares and do not cover their cost of capital. Casino, a French firm, has already shrunk, says Edouard Aubin, of Morgan Stanley. He thinks Carrefour could slim down to five countries from a peak of more than 20 (although it said this week it would keep expanding in China and Brazil). Walmart is cutting the number of stores it has in emerging markets. Tesco seems to have abandoned its dream of controlling big businesses in Turkey and China.

In the next few years more firms may follow the example of some supermarkets and retreat from the developing world. Most, though, will adapt, cutting capital investment and pruning their portfolios. All this will create opportunities for rising local firms. On February 19th, as Peugeot announced its giant write-off of emerging-market assets, Dongfeng, its Chinese partner, said it would take a 14% stake in the French firm and that technology-sharing between the two would speed up. There are rumours that General Motors may sell its loss-making Indian plant to its Chinese partner, SAIC. In 2011 ING sold its large Latin American business to Grupo Sura, a Colombian conglomerate intent on becoming a regional player.

The rich-world firms that remain will need to make their business models weatherproof, not just suited for the sunny days of a boom. That means shifting even more production to emerging markets and borrowing in local currencies—both are a natural hedge against currency turbulence.

As others falter, the strongest multina-

tionals are making bolt-on acquisitions. In 2013 Unilever bought out some minority shareholders in its Indian business for \$3 billion and Anheuser-Busch InBev took control of Grupo Modelo, a Mexican rival, for \$20 billion. The year before Nestlé spent \$12 billion buying Pfizer's baby-food business, which is mainly exposed to the emerging world. Rather than being the panacea envisioned by many Western firms during the boom, emerging markets are governed by the oldest business rule of all—survival of the fittest. ■



Chevron and Ecuador

Courtroom drama

NEW YORK

A judge finds foul play behind a controversial case against Chevron

“THIS case is extraordinary. The facts are many and sometimes complex. They include things that normally come only out of Hollywood.” So wrote Lewis Kaplan, an American federal judge, in a gripping, John Grisham-esque 485-page verdict on March 4th. It found that a controversial multi-billion-dollar judgment in Ecuador against Chevron had been “obtained by corrupt means”, lambasting Steven Donziger (pictured above), the prominent New York lawyer who had brought the case against the oil giant.

The ruling, in a civil case brought by Chevron, provides a large measure of vindication for the firm, which opted to fight rather than bow to the usual pressure on big businesses to minimise bad publicity by accepting an out-of-court settlement. In 2011 an Ecuadorean court had ordered it to pay \$19 billion—later reduced to \$9.5 billion—to clean up environmental damage ►►

in the Lago Agrio oilfield in the Amazon region. This was allegedly done, more than 20 years ago, by an arm of Texaco, a smaller firm Chevron bought in 2001. Its supposed responsibility for miserable conditions experienced by rainforest dwellers has become a pet cause of celebrities such as Mia Farrow and Trudie Styler, environmental groups and Rafael Correa, Ecuador's president. (An earlier Ecuadorean government had declared that Texaco had shed its legal responsibility by cleaning up the affected areas.) Last October Mr Correa accused *The Economist* of "barefaced lies" and of acting on behalf of Chevron because of our reporting of the case, allegations that we reject firmly.

Mr Kaplan delivered an eviscerating commentary on the actions of Mr Donziger and two of his Ecuadorean clients. The three, he ruled, will not be allowed to benefit in any way from the verdict they "obtained by corrupt means" in Ecuador. Among other things, the judge found that fraudulent evidence had been submitted to the Ecuadorean court; the main "independent" expert advising it was secretly in the pay of Mr Donziger's team; one Ecuadorean judge had been coerced and another bribed; American judges had been intimidated; and Mr Donziger and his clients controlled the body to which the damages were ordered to be paid.

The judge described Mr Donziger as an "ultimate command" of a criminal "enterprise" that also included environmental groups and public-relations, law and consulting firms, that sought to use a high-profile campaign of false allegations to extort money from Chevron.

Mr Donziger plans to appeal against the ruling. He says it relied on evidence from an Ecuadorean judge who has admitted being paid by Chevron. Mr Kaplan's ruling accepts that there are credibility issues with that testimony, but says that the other evidence is sufficient to support his conclusions. Ironically, some of the evidence considered most damning by Mr Kaplan came from out-takes from "Crude", a documentary about the Lago Agria case made at Mr Donziger's behest.

The ruling does not undo the decision of the Ecuadorean court. Yet Chevron hopes it will at least persuade judges in other countries, including Argentina, Brazil and Canada, that they should not use the Ecuadorean court decision to enforce claims against the oil firm's assets there.

Mr Kaplan reached no conclusion on whether Chevron had a case to answer regarding the environmental damage. Instead, he noted, the behaviour of Mr Donziger and his clients meant that the truth of that matter will now probably never be known. As Mr Kaplan hints, this case seems made for Hollywood, with one big difference: this time, the victim is not the plucky lawyer but the big oil company. ■

Distributed generation

Devolving power

Big batteries threaten big power stations—and utilities' profits

WHO needs the power grid when you can generate and store your own electricity cheaply and reliably? Such a world is drawing nearer: good news for consumers, but a potential shock for utility companies. That is the conclusion of a report this week by Morgan Stanley, an investment bank, which predicts that ever-cheaper solar and other renewable-energy sources, combined with better and more plentiful batteries, will allow many businesses and other electricity users to cut the cord on their electricity providers.

Tesla Motors, an American maker of electric cars, recently said it will build a "gigafactory", which by 2020 will turn out as many lithium-ion batteries as the whole world produced last year. These batteries can do more than power cars; they can also store electricity which is produced when it is not needed, and discharge it when it is.

So the factory's huge output of efficient batteries will boost the idea of distributed generation—producing electricity in small quantities near the point of use, rather than in large amounts in a few places. In another indication that the idea's time has come, GE has just set up a new business bringing together parts of its transport, aviation and engines divisions, to meet what it calls a "\$100 billion opportunity".

Small power stations are nothing new, but in the past they tended to use a lot of

capital and energy relative to the sizzle they produced. Now it is possible to build small, cheap and efficient plants that produce power in the tens of megawatts (MW) at most (a typical coal-fired power station produces it in the hundreds). This not only cuts transmission costs but reduces the risk of widespread power cuts, and the economic damage that results.

Not all distributed-power schemes involve renewable sources, or batteries. Wesleyan University in Connecticut has installed a system based around an efficient engine running on natural gas (which fracking has made cheap in America). Besides generating about 95% of the electricity that the university needs, the set-up captures much of the engine's waste heat to provide heating and hot water, cutting the institution's net energy consumption by 30%.

In poor, volt-starved countries, a lorry-mounted aircraft engine can become a mobile gas-fired power station. GE recently installed 24 such units in Algeria, providing 30MW of power. Local difficulties meant it took six months; that was fast by the standards of big power stations, "but we could have done it in ten days," says Lorraine Bolsinger, who heads GE's new distributed-generation business.

Waste-recycling schemes are playing a role too: with the right bugs, anaerobic digesters can gobble up any kind of organic waste, from food scraps to cow dung, giving off methane that can be used to run a generator. But by far the most disruptive new power source is solar panels. Morgan Stanley reckons that if Tesla's factory provides the cheap batteries it promises, Californian households will be able to run off a solar-plus-storage system costing just \$350 a year. Buying electricity off the grid may cost them around \$750 a year by then.

Morningstar, an investment-research firm, says that though distributed generation represents only 1% of America's installed capacity now (compared with 20% in Germany), it could make up a third by 2017 and could "kill" utilities in their current form. Small-scale producers will dump their surplus power on the market at prices below those at which the utilities can recoup their cost of capital—and thus pay to maintain the grid.

America's Electric Power Research Institute last month produced a paper highlighting the dangers of an unplanned move to distributed generation, using ■



From the age of steam to the solar age

► Germany as an example. The dash for renewables there has strained the power network and made life hard for utilities. This week one of the country's largest, RWE, announced that it made a net loss of €2.8 billion (\$3.8 billion) in 2013, its first annual loss in more than 60 years, as the rising supply of electricity from (subsidised) renewable sources undercut its prices.

In America two organisations more accustomed to scrapping with each other—the Edison Electric Institute, a trade body, and the Natural Resources Defence Council, a green group—have jointly urged regulators to revamp their rules, among other things to encourage utilities to keep investing in upgrading the grid. That way, they say, both large- and small-scale power producers will flourish in an age in which “power flows in two directions”. ■

Clean technology in China

Red light, green light

SHANGHAI

China's anti-pollution drive will make it a good place for clean-energy firms

“ENVIRONMENTAL pollution has become a major problem, which is nature's red-light warning.” Those green-tinted words do not come from an activist. Rather, they come from China's leaders, who gathered this week in Beijing for a big annual meeting. On March 5th Li Keqiang, the prime minister, vowed to declare war on pollution.

The timing could not have been better, then, for the launch of a firm devoted to the manufacture of greener engines. The same day EcoMotors, a startup backed by Bill Gates and Khosla Ventures (supported by Vinod Khosla, a Californian venture capitalist), unveiled its joint venture with a division of China FAW Group, a local car-maker. The Chinese partner vowed to spend more than \$200m on a factory in Shanxi, a northern province, that will produce 100,000 of the new engines a year.

The venture's “OPOC” two-stroke engine, a novel twist on a century-old idea, consists of a pair of cylinders, each containing two opposing pistons. Its backers claim its fuel-efficiency will be up to 45% better than the four-stroke engines commonly used in cars. The technology was developed with financial help from the Defence Advanced Research Projects Agency, an arm of the Pentagon with a record of promoting breakthroughs (robot legs and self-driving cars are two others).

The engine can run on a variety of fuels. The plan is first to make diesel engines for use in lorries, and only later to consider petrol versions for cars. However, local

Women and work

The glass-ceiling index

The best—and worst—places to be a working woman

AS IT is International Women's Day on March 8th, *The Economist* has created a “glass-ceiling index”, to show where women have the best chances of equal treatment at work. It combines data on higher education, labour-force participation, pay, child-care costs, maternity rights, business-school applications and representation in senior jobs. Each country's score is a weighted average of its performance on nine indicators.

To no one's surprise, Nordic countries come out well on educational attainment and labour-force participation. Women are also relatively well represented in their parliaments; Finland and Sweden were among the first countries to allow women to vote and stand for election. Yet even there women are paid less than men for similar work. In Finland and Sweden the gap is close to the OECD average of 15%, though in Norway it has fallen to 8%.

In Finland women accounted for almost half of those who took the GMAT, an entrance exam for business schools, in 2012-13. Worldwide, the share was 43%, an increase of five points in a decade. In Norway nearly two-fifths of board members for the largest listed companies are women, thanks largely to the introduction of mandatory quotas in 2008. That is twice the share in the European Union, which is considering bringing in quotas if the current voluntary approach fails.

boosters in Shanxi also want future configurations to burn methanol, which can be made from abundant local coal supplies.

Another noteworthy aspect of this deal, argues Andrew Chung of Khosla Ventures, is that it suggests the best way for inventive energy startups to achieve scale: make a big push in China. Despite the downturn in the solar business there (see page 75), Bloomberg New Energy Finance, a research firm, estimates that the clean-technology market in China exceeded \$60 billion last year, whereas America's was less than \$50 billion.

Commercialising new technologies is not easy in rich countries, says Amit Soman, the president of EcoMotors, since slow growth and legacy assets make incumbent manufacturers reluctant to take a punt on unproven new kit. But in China his firm has already reached two non-exclusive deals. In one of these, EcoMotors signed a \$200m licensing agreement last April to let Zhongding Power make a version of its engines for diesel generators.

At the bottom of our index are Japan and South Korea. Too few women there have jobs, few senior managers or board members are women and pay gaps are large—in South Korea, at 37%, the largest in the OECD. If, in the UN's words, “equality for women is progress for all”, both countries have a long way to go.

Not so grim up north

100=best for working women
2013 or latest



Sources: OECD; Catalyst; European Commission; GMI Ratings; Graduate Management Admission Council; Inter-Parliamentary Union; *The Economist*

Interactive: Select weights for nine indicators to create your own index at Economist.com/glassceiling

“The innovation cycle is being completed in China and other emerging economies, not America,” says Mr Chung. Maybe so, but there are two caveats. The first is that Chinese firms will not pay much for intellectual property, and will copy it as soon they figure out how. The second, observes Jonathan Woetzel of McKinsey, a consulting firm, is that only technology firms that “fit conveniently into the Chinese ecosystem”, to the benefit of local companies, will be allowed to prosper.

Consider the much-trumpeted recent arrival of Tesla Motors in China. The American electric-car firm unarguably has cutting-edge clean technology, but its business model of importing all its vehicles does not enrich powerful Chinese firms or transfer intellectual property to local joint ventures. So the subsidies and tax breaks lavished by China's central and local governments on buyers of even the most wretched “new energy vehicles” made there will not be offered to purchasers of Tesla's gorgeous green machines. ■

Schumpeter | Unpacking Lego

How the Danish firm became the world's hottest toy company



IT IS getting harder to go anywhere without stepping on a piece of Lego-related hype. “The Lego Movie” is number two at the American box office, after three weeks at number one. Model kits related to the film are piled high in the shops. They will add to the already gigantic heap of Lego bits: 86 for every person on the planet. The toymaker has enjoyed ten years of spectacular growth, almost quadrupling its revenue. In 2012 it overtook Hasbro to become the world’s second-largest toymaker. The number one, Mattel, is now seeking to buy the Canadian maker of Mega Bloks toy bricks, to fend off the challenge from Lego.

This is remarkable for many reasons. Lego’s home town, Billund in rural Denmark, is so small that the company had to provide it with a hotel—an elegant one, unsurprisingly. The toy business is one of the world’s trickiest: perennially faddish (remember Beanie Babies?) and, at the moment, convulsed by technological innovation. Children are growing up ever faster, and abandoning the physical world for the virtual. To cap it all, the company almost collapsed in 2003-04, having drifted for years, diversifying into too many areas, producing too many products and, in a fit of desperation, flirting with becoming a “lifestyle” company, with Lego-branded clothes and watches.

Lego’s decade of success began when it appointed Jorgen Vig Knudstorp as chief executive. This was a risky move: Mr Knudstorp was a mere 35 years old and had cut his teeth as a management consultant with McKinsey rather than running a business. But it proved to be inspired. Mr Knudstorp decreed that the company must go “back to the brick”: focusing on its core products, forgetting about brand-stretching, and even selling its theme parks. He also brought in stricter management controls, for example reducing the number of different pieces that the company produced from 12,900 to 7,000.

Under Mr Knudstorp Lego has struck a successful balance between innovation and tradition. The company has to generate new ideas to keep its sales growing: customers need a reason to expand their stock of bricks, and to buy them from Lego rather than cheaper rivals. But at the same time it must resist the sort of undisciplined innovation that almost ruined it. Lego produces a stream of kits with ready-made designs, such as forts and spaceships, to provide children with templates. But it also insists that

the pieces can be added to the child’s collection of bricks, and reused to make all sorts of other things.

Lego has got better at managing its relationships. “The Lego Movie” demonstrates how it can focus on the brick while venturing into the virtual world: Warner Bros. made the film while Lego provided the models. During its years of drift it relied too much on other firms’ blockbuster franchises, such as Harry Potter and Star Wars. This time its intellectual property, not someone else’s, is the star of the film. It has also got better at tapping its legion of fans—particularly adult fans of Lego, or AFOLS—for new ideas.

Can the company continue its winning streak? Its growth is slowing: its net profits grew by 9% in 2013 compared with 35% in 2012, and its revenues rose by 10% compared with 23% in 2012. Mr Knudstorp suggests that harder times are ahead: “When the company is getting bigger and the market isn’t growing, it’s a pure mathematical consequence that growth rates will have to reach a more sustainable level.” Lego is now at an inflection point, building its organisational capacity and embracing globalisation, to help it find new sources of growth.

Last year the company invested Dkr2.6 billion (\$478m) in production facilities and added more than 1,300 full-time workers, a 13% increase. It is expanding two existing factories—in Kladno in the Czech Republic and Monterrey in Mexico—and building two new ones—in Nyiregyhaza in Hungary and, most important of all, in Jiaxing in China. Its management is being globalised too, with regional offices being opened in Singapore and Shanghai (as well as in London). The aim is twofold: to replicate in the rapidly growing east Lego’s success in the west; and to transform a local company that happened to go global into a global company that happens to have its head office in Billund.

Late to the party

Globalisation, as we point out at length in our business section this week, is fraught with difficulties. Lego is relatively late in making its China play—jumping in when some other western firms are jumping out with nothing but regrets to show for it. Lego also owes its identity to its roots in small-town Denmark: Ole Kirk Kristiansen, its founder, made up the name from the first two letters of two Danish words, *leg godt*, or play well, and committed his company to “nurture the child in each of us”. An earlier attempt to move some of the responsibilities for designing products to an office in Milan proved to be a disaster. But the logic of globalisation is nevertheless compelling. The Chinese middle class is exploding, the toy business in the west is stagnant, and Lego needs a global workforce if it is to serve a global market.

Lego also has one important force on its side in its battle to globalise: parents in emerging markets, just like those in the rich world, are convinced that the company’s products are good for their children. Grown-ups everywhere welcome it as a respite from the endless diet of videos and digital games that their offspring would otherwise consume. Chinese adults, including those very grown-up ones in government ministries, hope it will provide the secret ingredient that their education system sorely lacks: creativity. “The Lego Movie” may be providing the company with a welcome boost during the toy industry’s post-Christmas doldrums. But Lego’s long-term success rests on the way adults feel reassured at buying a toy whose roots lie in an age before video games, mobile apps and toy-themed films. ■

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Cyprus one year on

Injured island

NICOSIA

The bail-out is working; the bail-in isn't

BARELY five years after it adopted the euro, Cyprus notched up a more unwelcome date in the history books. In March 2013 it became the fifth country in the single-currency area to be rescued. The terms of European creditors for its bail-out included not just the usual demands for austerity and reforms but an unfamiliar demand for a banking "bail-in"—getting debt holders and uninsured depositors to absorb bank losses and to stump up new capital. The experience of this small island has big implications; bailing-in creditors will be how future banking crises are tackled in Europe.

The trauma of last spring, when banks were closed for nearly two weeks and capital controls imposed, was expected to have a devastating effect on Cyprus. The economy is indeed suffering (see chart): after a 2.4% drop in 2012, output fell by 5.4% last year. Though painful, that was nonetheless milder than the 8.7% decline forecast last April by the troika, representing the European authorities and the IMF.

The Cypriot economy has turned out to be more resilient than many people had expected. At the time of the rescue the economy was commonly characterised as one that had boomed solely on the back of its overextended banks. At their peak, in 2009, these had reached Icelandic proportions, with assets worth nine times GDP. But Cyprus has other strengths, notably tourism and business services, which have

held up reasonably well.

Tourist numbers did fall in 2013, especially from the rest of Europe, but an influx of Russians tempered the reduction to 2.4%. And because the Russians were higher-spending, income from tourism rose by 8%. At the Four Seasons hotel in Limassol, Russians make up nearly half the guests; a local taxi service has hired a Russian-speaker to manage its bookings.

One fear was that another pillar of the economy, business services (especially law and accounting), would suffer along with the financial sector because of capital controls. Although business services have taken a knock, they have declined less than the economy as a whole. In fact, as Evgenios Evgeniou, head of PwC Cyprus,

points out, the sector's rise predated the banking surge of the past decade; Cyprus replaced conflict-torn Lebanon as a business hub in the eastern Mediterranean.

Remaining domestic restrictions on capital movements will be removed this spring, says Harris Georgiades, the finance minister, though controls on transfers out of the country will remain in place. Despite these encouraging signs, it was premature of Nicos Anastasiades, the Cypriot president, to claim recently that the country was on the way to "a new economic miracle" (the first was the recovery after the Turkish invasion of 1974). The troika now think the economy will do worse in 2014 than their April forecast, with GDP declining by 4.8% rather than by 3.9%. Andreas Assiotis, an economist at Hellenic Bank, predicts a contraction of 5.8%.

The main cloud hanging over the economy is the sorry state of Bank of Cyprus (BOC), the country's biggest bank. Since Cypriot banks were mainly deposit-based, with little debt issued to bondholders, the bail-in involved tapping uninsured deposits—those above €100,000, or \$135,000—to cover losses and reboot the bank. As part of the deal, BOC absorbed the loans and insured deposits of Laiki, formerly the second-biggest bank, after its uninsured deposits had been comprehensively bailed in. The new bank was then recapitalised by converting 47.5% of BOC's uninsured deposits into equity.

The bank re-emerged from this process at the end of July with a respectable capital ratio of 10.5% of its risk-weighted assets. It has a new and energetic boss, John Hourican, who took over in October. He had previously spent over four torrid years dealing with another broken bank as head of investment banking at Royal Bank of Scotland, a job he had to quit a year ago after the LIBOR-rigging scandal (the bank ►►

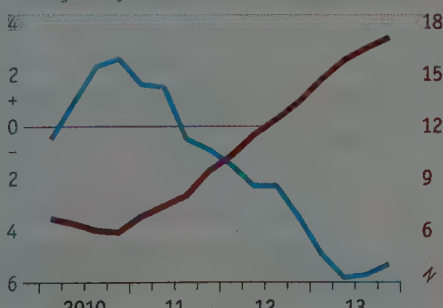
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Hard times

Cyprus:

GDP
% change on a year earlierunemployment rate
%

Source: Eurostat

► cleared him of any involvement in or knowledge of the misconduct).

One step that Mr Hourican is taking at BOC is to reduce its remaining international exposures. Another is to rationalise its core activities in Cyprus, which represent around 85% of its loans and deposits. The number of branches has been slashed (from 203 last May to 130) and the workforce cut back. Mr Hourican is also shaking up the culture not just of BOC but of Cypriot banking by intervening early when clients fail to service their debts.

The task of turning round BOC is, however, immense, for two related reasons.

First, by absorbing Laiki's gross loans in Cyprus, the bank doubled up on its exposure to the Cypriot economy—and in particular to property, which provides the collateral for its loans. At the end of last year 53% of its loans were non-performing (more than 90 days overdue in payments), up from 36% in June. With the economy and property market still falling, this bad-debt mountain will get even bigger, while the collateral will shrink further.

Second, the extraordinary events last year, when for a week insured as well as uninsured deposits faced a bail-in, have sapped confidence in banks, particularly

in BOC. There is a gaping hole in BOC's balance-sheet between its loans and its deposits, such that its loans are 45% greater than its deposits. The shortfall is met by €11 billion of central-bank funding, of which almost €10 billion is emergency liquidity assistance, a measure of the bank's plight.

As long as the country's main lender remains stricken, it is hard to see how Cyprus can stage a sustainable recovery, says Sir Christopher Pissarides, a Nobel-prize-winning economist who heads the country's economic council. Even though the economy has been hurt a bit less than expected, it remains in intensive care. ■

Buttonwood | Revolutionary forever

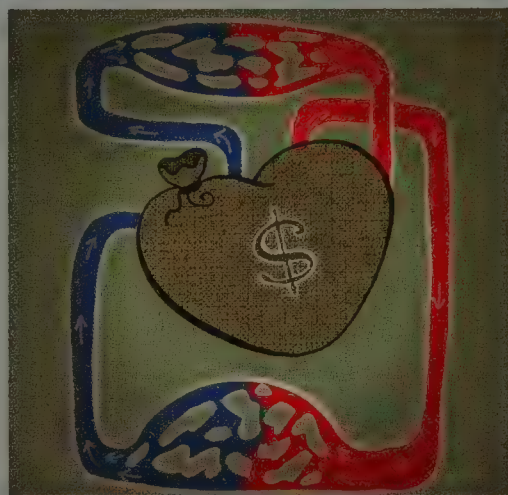
Does economics need a rethink?

AS THE old joke goes, the questions in economics exams are the same every year; only the answers change. Just 40 years ago, the emergence of stagflation was prompting the monetarists to challenge the disciples of John Maynard Keynes, but after the crisis of 2008 the enthusiasm for Keynesian stimulus was discovered all over again.

In a new book* George Cooper, a fund manager, suggests that the economics profession is itself in a state of crisis. It needs the kind of shift in thinking that Copernicus brought to astronomy, or Charles Darwin to biology, Mr Cooper argues. He cites Thomas Kuhn's theory of scientific revolutions. First, the existing models are proved wrong by the facts. Second, the experts try to adjust the theory to account for the anomalies, leading to ever-greater complexity. Third, a new theory is put forward that throws away the existing framework. Fourth, the theory is attacked by the experts as being incompatible with the existing model. Finally, younger, more open-minded scientists accept the new theory and it becomes the consensus.

Economics fits the pre-revolutionary template, he argues. It has fractured into many incompatible schools of thought. It has created complex models without noticeably improving the accuracy of its predictions. And many of those models ignore features of the real world.

Neoclassical models, for example, are built on the assumptions that individuals make their own decisions based on self-interest, that they seek to maximise their welfare and that the result is a stable system that tends to equilibrium. Yet as behavioural studies have shown, individuals are not always rational optimisers. Mr Cooper suggests that neoclassical economists treat evidence that humans



are not rational as "problematic, inexplicable and annoying—but also ignorable."

Instead, he thinks people act as competitors, not maximisers. Usain Bolt does not always try to run the 100 metres in the fastest possible time; he just runs quickly enough to beat his rivals. Some luxury products known as Veblen goods do not obey the laws of supply and demand; as the price rises, demand goes up. That is because competitive humans like to display their social status with such goods. If people are competitors, Mr Cooper argues, it is highly unlikely that the economy will settle into equilibrium, since people will always be attempting to upset the status quo.

The logic of competition helps to explain, in his view, why there was so little economic growth before the Industrial Revolution. This lack of growth is a problem for those who believe that the West's modern difficulties are caused by excessive government regulation and high taxes; the world before 1700 had minimal government and low taxes.

Before 1700, those in power had little interest in economic growth; they were concerned with maintaining their social posi-

tion and were suspicious of any disruptive forces. The big change came with the arrival of constitutional liberalism in Britain after the Glorious Revolution of 1688 and in America after 1776. The demise of absolute monarchies allowed the forces of competition to have free rein.

All this leads to what Mr Cooper sees as his crucial insight, akin to William Harvey's explanation of the circulation of the blood. In a pre-industrial economy, wealth flows up from the bottom of society to the top in the form of taxes and stays there. But in a democratic society, social mobility is more fluid, creating the incentive for capitalists to create wealth. At the same time, progressive taxation means that wealth flows back to the bottom and keeps the circulation flowing. This has been vital to capitalism's success.

Today's problems, according to Mr Cooper, are caused by the high debts built up by those lower down the social scale; debt transfers money from poor to rich. What is needed is thus an injection of money at the bottom of the pyramid, via fiscal stimulus, rather than "quantitative easing", which pushes up asset prices and benefits the rich.

Whether mainstream economists will take Mr Cooper's ideas seriously is doubtful; his book has no formulae (and few statistics). Sceptics could also point out that the Asian experience does not suggest democracy is necessary for rapid economic growth. But for those with an open mind his criticisms of the economics profession, and suggestions for new ways forward, will be extremely welcome.

* "Money, Blood and Revolution: How Darwin and the doctor of King Charles I could turn economics into a science" (Harriman House)

Civil servants and austerity

The times they aren't a-changin'

Civil-service payrolls have held up surprisingly well

AFTER the party, the hangover. When debt-fuelled economic growth came to a crashing halt in the financial crisis of 2008, governments across much of the rich world sought to cut spending. One obvious target was the state's payroll.

Leviathan's minions are certainly costly. In the European Union public-sector wages and salaries take up about 10% of GDP. The Initiative for Policy Dialogue, based at Columbia University, reckons that since 2010 almost 100 governments have set out plans to cut their payrolls.

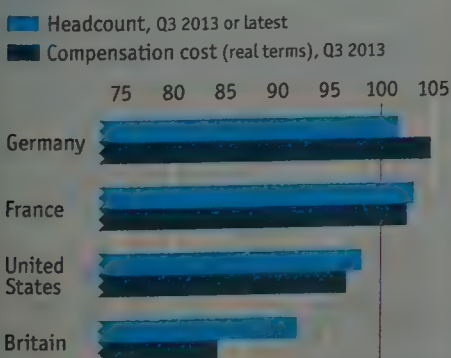
Some cuts may be savage. The headcount in many British government departments may fall by as much as 40% by 2019 from current levels, says a recent report from the Institute for Fiscal Studies, a think-tank. Relative to its 2012 level Italy plans to jettison 20% of public-administration managers by 2016.

However, aggregated data on public-sector headcounts offer some surprises (see chart). Whereas Britain's public-sector workforce has already contracted by 8% since 2007, in Germany and France the number has increased.

More intriguing still is what has happened to compensation costs—the amount governments pay bureaucrats in wages and salaries, but not pensions. Of the 30 countries in a Eurostat database, half are spending more after inflation on public employees than they were in 2007, even in cases where headcount has fallen. The euro zone as a whole spends only 17% less on government wages than it did six years ago. Belgium spends 10% more, Luxembourg 24%. And since 2007, 21 countries, including Cyprus, Italy and France, have not cut the proportion of GDP that they devote to public servants' wages.

Yes, prime minister

Public-sector workers, 2007=100



Sources: Eurostat; OECD; national statistics; The Economist

Finding explanations for dearer public payrolls is tricky. One reason might be wage drift—the automatic increases in salaries that can occur as civil servants are granted annual promotions in seniority, simply for having been in their jobs for another year. In 2012, for example, more than 600,000 staff from Britain's National Health Service received rises averaging 3.5%, despite a pay freeze. In 2010 Barack Obama also decided to freeze government pay, yet the median salary for federal employees climbed by over \$3,000 during the following two years. Wage drift could outweigh the effect of reduced headcount, which is likely to be concentrated in the lower echelons of the civil service.

Chinese bonds

Not so sunny

SHANGHAI

China's first domestic bond default marks a maturing market

HAS China arrived at its Bear Stearns moment? Analysts at Bank of America Merrill Lynch, an investment bank, worry it may have done so after the first default in China's domestic bond market since the central bank started regulating the market in 1997. On March 4th Shanghai Chaori Solar Energy Science and Technology Co, a struggling solar-equipment supplier, declared that it lacked the cash to make the full interest payment on a corporate bond.

Fear of a chain reaction leading to a liquidity crunch seems excessive. After all, the troubles of the country's solar industry (wracked by overcapacity and drowning in red ink) are well known. Suntech, once the world's biggest solar firm, defaulted last year on debt owed to foreign investors.

Chaori itself has already escaped an earlier potential bond default, thanks to intervention by its local government. Although the amount due this week was trifling (less than \$15m), no government bail-out was on offer. An insider adds that the firm may eventually default on the 1 billion yuan (\$163m) principal that is owed as well as on the interest payments.

Most analysts are relaxed. Sun Jianbo of China Galaxy, a local stockbroker, argues that this default is unlikely to lead to a meltdown of China's nascent but fast-growing market for corporate debt (see chart). He believes that there are two kinds of Chinese domestic bonds: those with strong government support and those with limited official backing. Because the market did not expect Chaori to be bailed out (unlike, say, important state-owned enterprises), panic will be limited, he says.

Fitch, a ratings agency, even declares

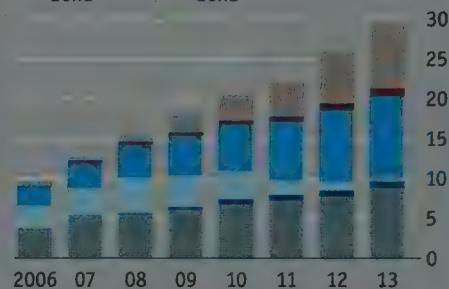
Another possibility, suggests Alberto Alesina of Harvard University, is that governments simply failed to implement planned spending cuts. At the end of January Greece's highest administrative court ruled that pay reductions for the armed forces and emergency services were unconstitutional: the government now faces a heavy bill in back pay. Portugal's constitutional court also opposed the scrapping of Christmas bonuses for civil servants on similar grounds.

These data are worrisome. The implicit trade-off of austerity was pain now, prosperity later. Yet as growth in advanced economies picks up, many civil services seem no more streamlined than before. ■

Too big to worry

China's bond markets, yuan trn outstanding

Treasury
Local-Government bond
Central-Bank bill
Financial bond
Government-supported bond
Corporate bond



Sources: WIND; Barclays Research

that this default will be a "long-term positive for the market." Voices in this camp believe that officials are allowing a default by a minor firm as a signal to investors to start pricing risks properly. Ivan Chung of Moody's, another ratings agency, notes that the absence of defaults has left the immature market without the proper infrastructure for working out such things as creditors' meetings, bankruptcy proceedings and the pecking order of various bondholders.

Moreover, there is little chance that a default this week will lead to a broader bond-market seizure. Many corporate bonds are still held by banks and insurers to maturity, limiting the scope for panic.

There is just a chance, though, that if a string of such defaults were to occur then the market might get jittery. The opacity of China's financial markets could add to contagion. If investors lack the information needed to judge whether firms are safe or not, they may dump the good along with the bad.

Flood insurance

Waves of problems

CHERTSEY

New proposals to reform subsidised flood insurance do too little to reduce risk

AT FIRST glance, Foxglove Mead in Chertsey looks like any other housing estate being built in Britain. As many as 98 homes, some worth £600,000 (\$1m), are planned. But step onto the show-home's newly laid lawn, where your correspondent felt his feet sink into the waterlogged soil, and questions over the suitability of this site become clear: these buildings are in an area at high risk of flooding. Pools of water from floods that last month inundated nearby houses (see picture) still cover neighbouring meadows.

Sadly, this is but one of many new residential developments going up on floodplains and tide-swept coasts around the world: 21% of new homes built in London since 2010 are in high-risk areas. Instead of discouraging the building of flood-prone houses, governments are unwittingly encouraging homeowners to flush money down the drain.

Most homes are built (or sold) only if they are mortgageable, and lenders sensibly insist that buildings are insured against common risks including that of flooding. This ought to provide a reliable mechanism to prevent the building of houses in places where they are at high risk of being regularly submerged. But governments are blunting these incentives with policies to subsidise and pool flood risks instead of pricing them in the market.

In America, Congress is reversing re-

forms passed in 2012 that cut federal subsidies for the National Flood Insurance Program (NFIP), a public insurer. On March 4th the House of Representatives approved a bill levying a \$25 surcharge on all the NFIP's residential policies (\$250 for businesses and second homes) to continue to subsidise premiums in high-risk areas.

In Britain the government has proposed that all households taking out buildings insurance will pay £10.50 to Flood Re, a not-for-profit fund, to subsidise premiums for 500,000 high-risk houses (which will pay little more than low-risk homes). Germany and the Netherlands are considering similar pooling schemes.

Supporters of the reforms in America say they will help reduce the NFIP's \$24 billion deficit. And in Britain, it is envisaged that Flood Re, which currently relies on state support, will become self-sufficient.

That may prove optimistic. Higher premiums for the low-risk properties could encourage their owners to self-insure for flood risk, reducing the cross-subsidy available for flood-prone areas, says Diane Horn at Birkbeck College, University of London. That could cause pool deficits to rise, instead of diminish, over time.

Neither are the new schemes' pooling mechanisms likely to favour those in the most need of help, reckons Erwann Michel-Kerjan at the Wharton School of Business. France funds its pool with a 12% levy

on premiums, but the proposed fixed-rate contributions in Britain and America will be the same for mansions and hovels.

The bigger crime is that pooling encourages building in flood-prone areas. The value of property covered by the NFIP, for instance, has increased nine times in real terms since 1978. Much of this is because it helped make risky spots financially viable to build on, Mr Michel-Kerjan says. Of the properties insured by the NFIP that have suffered repetitive losses, one in ten have now received insurance payouts worth more than their total value.

In time, insurance claims may well rise as extreme weather hits more frequently. The costs of flood damage in Europe will increase fourfold between now and 2050, reckons a report by a team of scientists published on March 2nd in *Nature climate change*. As much as two-thirds of the extra damage, the researchers say, will be caused by incentives to develop in risky areas. For flood insurance, it seems, a problem shared may in fact be a problem doubled—or worse. ■

Rigging currency markets

Bank, fix thyself

The Bank of England faces questions over its role in rigged forex deals

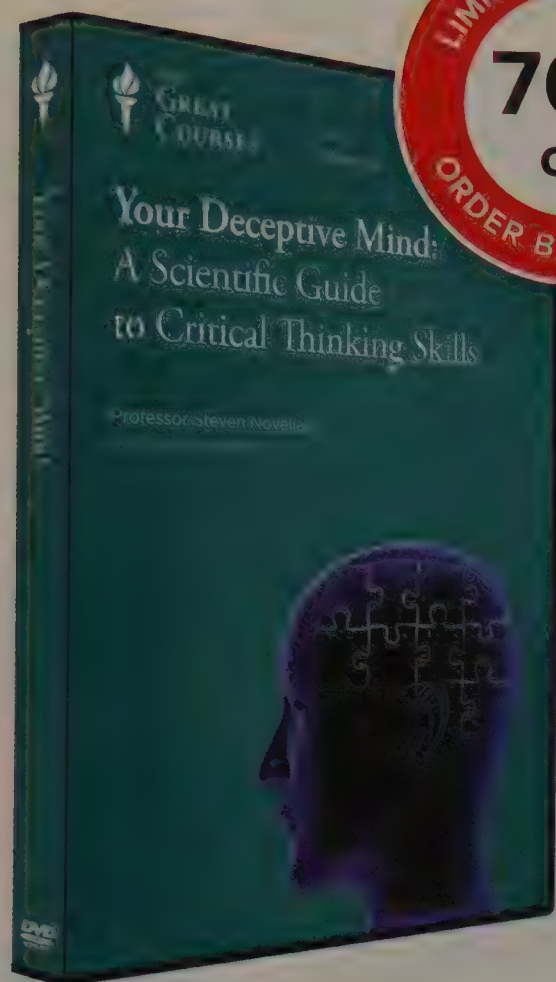
ABOUT two dozen staff have so far been fired or suspended by banks for allegedly tampering with foreign-exchange markets. The latest twist in the saga came from an unexpected quarter: on March 5th the Bank of England announced that it too had suspended an official following an internal investigation. Awkwardly, Britain's central bank has gone from inquisitor to a possible protagonist in the latest episode of financial-market chicanery.

Regulators globally have spent months investigating whether forex traders at big banks rigged global currency markets, the world's largest, where turnover is over \$5 trillion a day. They suspect that bankers used their knowledge of what currencies their clients wanted to buy and sell to nudge market prices against them (and so in their own favour). If so, it would be the latest in a long list of financial benchmarks that have been rigged in ways that have bolstered bankers' bonuses. Fines are still pouring in over LIBOR, an interest rate used to peg contracts worth trillions, which traders fiddled.

A plausible defence from the bankers in the latest probe might be that they had told the Bank of England exactly what they were doing. Minutes from regular meetings between the central bank and traders ►►



The beauty of risk pooling



Your Deceptive Mind: A Scientific Guide to Critical Thinking Skills

Professor Steven Novella
YALE SCHOOL OF MEDICINE

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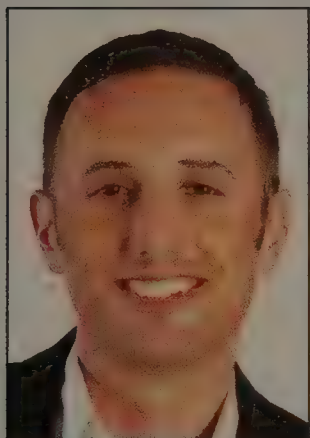
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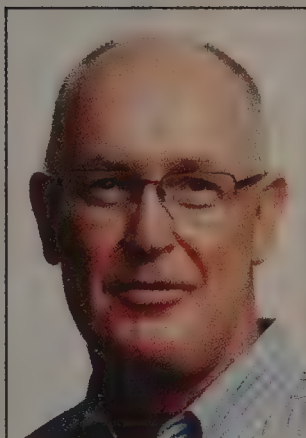
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showed widespread concern about the structure of the currency markets as early as 2006. All sides agreed that it was open to abuse because many clients, from multinational companies to mutual funds with foreign holdings, tended to buy and sell currencies from their banks at a single daily reference rate, the "London fix", which is calculated using trades executed in 60 seconds of trading at 4pm in London.

That means rigging the market for just a minute could reap rich rewards. A bank that had agreed to sell lots of Canadian dollars, say, for a corporate customer could, in effect, depress that currency's price at the fix and so buy them for itself at a slightly lower price. Bankers allegedly shared trading positions ahead of the fix, in internet messaging groups, among them "The Cartel" and "The Bandit's Club" (traders are not known for their subtlety).

Regulators think this is tantamount to fraud; banks have argued they were injecting order in an otherwise unworkable marketplace. Notes taken by a trader at a meeting organised by the Bank of England in April 2012 suggest the traders had told the bank that they regularly shared information on forex positions. According to Bloomberg, the central bank at least tacitly endorsed their attempts to match buyers and sellers, purportedly to limit the volatility of everyone trading at the fix. Discomfitingly, the bank explicitly said notes should not be taken at the meeting. Its own minutes reportedly shed no light on the matter.

The Bank of England denies it endorsed any wrongdoing. After reviewing 15,000 e-mails, 21,000 chat messages and 40 hours of phone-call recordings, it said it had found no evidence its staff were privy to any collusion. But one person at Threadneedle Street had breached "rigorous internal control processes" and others have been reminded of the importance of keeping accurate records and telling higher-ups when they hear something noteworthy. A fuller investigation has been launched.

It is not the first time the central bank is painted as a conspirator in financial fiddling—or at least a tolerator of it. In 2012 the then-deputy governor, Paul Tucker, had to flatly deny he had sanctioned duff LIBOR submissions by Barclays at the height of the financial crisis. Chummy exchanges with Bob Diamond, at the time the boss at Barclays, made for awkward reading.

One potential problem for banks is that, unlike the people affected by LIBOR, it is easy for those who were fleeced by their forex bankers to figure it out (and to sue). Perhaps the most curious thing is the timing: much of the currency-market skulduggery happened after the banks had already come under investigation for LIBOR. That suggests banks were slow to clean up the rotten culture on their trading floors, or that they genuinely thought their colluding ways had been officially endorsed. ■



Gold

In a fix, Mr Bond

New concerns surround the way the world gold price is set

COMMODITY prices are not just for buyers and sellers of the physical stuff. They are also the basis of derivative markets—futures contracts, options, and combinations of these and other financial instruments—which can be far larger. A twitch in the "benchmark" price can mean big shifts in the value of derivatives, and profits for the prescient.

People unhappy with the way the world gold market works suspect that more than prescience may be involved. In a class-action lawsuit filed this week, Kevin Maher, a New York-based investor in the gold and derivative markets, is suing the five banks which set the benchmark—Deutsche, Barclays, Nova Scotia, Société Générale and HSBC—for collusion. Those banks that have commented say they will defend the suit vigorously.

Another bit of bad news for the gold market comes from a forthcoming paper by Rosa Abrantes-Metz, of New York University's Stern School of Business, and her husband Albert Metz, a ratings-agency chief (writing in a personal capacity). This identifies a puzzling number of large downward price movements in the run-up to the afternoon "fix": a conference call, typically ten minutes long, when the banks exchange information and decide on the price. Ms Abrantes-Metz terms the spikes "too frequent and too large" to be mere chance.

The couple have previously highlighted problems in other benchmarks, such as LIBOR (the London interbank offered

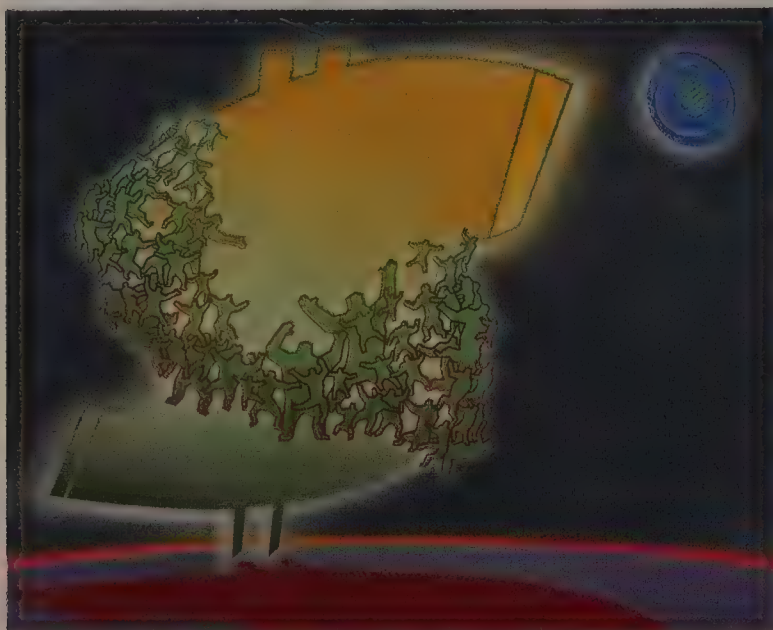
rate). Ms Abrantes-Metz says it is "troubling" that a "small group of people" with "complete lack of oversight" set prices in which they have multiple other interests. The anomalous spikes were not noticeable in the period 2001-03, she notes, but became apparent only after 2004, when the gold-derivatives market expanded sharply.

Some participants are getting jittery. Deutsche Bank is withdrawing from the gold- (and silver-) fixing processes, putting its seat up for sale. The German financial regulator, BaFin, has interviewed members of the bank's staff as part of a probe into potential market-rigging of both prices. Other financial supervisors around the world are investigating a range of commodity and interest-rate benchmarks. A hangover from an earlier, clubbier age (the London fix started in 1919), they were designed as a way of producing clear prices in illiquid markets. But to a suspicious modern eye, they look archaic and dodgy.

People who are involved in the gold market defend it robustly. Ross Norman, the chief executive of Sharps Pixley, a bullion broker, says that the methodology of the fix is "open, efficient and transparent" and known to regulators. He agrees that more visibility might help, but decries suggestions that the market could be rigged. Any systematic anomaly, he says, "would be grasped by dozens of institutions, who would make money on the arbitrage."

Free exchange | The once and future currency

A new book examines the world's love-hate relationship with the dollar



“LUMPY, unpredictable, potentially large”: that was how Tim Geithner, then head of the New York Federal Reserve, described the need for dollars in emerging economies in the dark days of October 2008, according to transcripts of a Fed meeting released last month. To help smooth out those lumps, the Fed offered to “swap” currencies with four favoured central banks, as far off as South Korea and Singapore. They could exchange their own money for dollars at the prevailing exchange rate (on condition that they later swap them back again at the same rate). Why did the Fed decide to reach so far beyond its shores? It worried that stress in a financially connected emerging economy could eventually hurt America. But Mr Geithner also hinted at another motive. “The privilege of being the reserve currency of the world comes with some burdens,” he said.

That privilege is the subject of a new book, “The Dollar Trap”, by Eswar Prasad of Cornell University, who shares the world’s ambivalence towards the currency. The 2008 financial crisis might have been expected to erode the dollar’s global prominence. Instead, he argues, it cemented it. America’s fragility was, paradoxically, a source of strength for its currency.

In the last four months of 2008 America attracted net capital inflows of half a trillion dollars. The dollar was a haven in tumultuous times, even when the tumult originated in America itself. The crisis also “shattered conventional views” about the adequate level of foreign-exchange reserves, prompting emerging economies with large dollar hoards to hoard even more. Finally, America’s slump forced the Fed to ease monetary policy dramatically. In response, central banks in emerging economies bought dollars to stop their own currencies rising too fast.

Could Fed swap lines serve as a less costly alternative to rampant reserve accumulation? If central banks could obtain dollars from the Fed whenever the need arose, they would not need to husband their own supplies. The demand is there: India, Indonesia, the Dominican Republic and Peru have all made inquiries. The swap lines are good business: the Fed keeps the interest from the foreign central bank’s loans to banks, even though the other central bank bears the credit risk. The Fed earned 6.84% from South Korea’s first swap, for example. But it is not a business the Fed wants to be in. As one official said, “We’re not advertising.”

Swap lines would help emerging economies endure the dollar’s reign. But will that reign endure? Mr Prasad thinks so. The dollar’s position is “suboptimal but stable and self-reinforcing,” he writes. Much as Mr Prasad finds America’s privileges distasteful, his book points to the country’s qualifications for the job.

America is not only the world’s biggest economy, but also among the most sophisticated. Size and sophistication do not always go together. In the 1900s the pound was the global reserve currency and Britain’s financial system had the widest reach. But America was the bigger economy. In the 2020s China will probably be the world’s biggest economy, but not the most advanced.

America’s sophistication is reflected in the depth of its financial markets. It is unusually good at creating tradeable claims on the profits and revenues that its economy generates. In a more primitive system, these spoils would mostly accrue to the state or tycoons; in America, they back a vast range of financial assets.

Mr Prasad draws the obvious contrast with China and its currency, the yuan, a “widely hyped” alternative to the dollar. China’s GDP is now over half the size of America’s. But its debt markets are one-eighth as big, and foreigners are permitted to own only a tiny fraction of them. China’s low central-government debt should be a source of strength for its currency. But it also limits the volume of financial instruments on offer.

America has a big external balance-sheet, if not an obviously strong one. Its foreign liabilities exceed its overseas assets. But this worrying fact conceals a saving grace: its foreign assets are unusually adventurous and lucrative. Its liabilities, on the other hand, are largely liquid, safe and low-yielding. America therefore earns more on its foreign assets than it pays on its foreign liabilities.

Alongside its economic maturity, America also has a greying population. This ageing is a source of economic weakness. But, Mr Prasad argues, it may be another reason for the dollar’s global appeal. America’s pensioners hold a big chunk of the government debt that is not held by foreigners. A formidable political constituency, they will not allow the government to inflate away the value of these claims. Thus America’s powerful pensioners serve to protect the interests of its generous foreign creditors.

America’s sophistication has one final implication: the dollar has no long-term tendency to strengthen. That again contrasts with its principal long-run rival. China is still a catch-up economy. As it narrows the productivity gap with America, its exchange rate, adjusted for inflation, will tend to rise. The yuan has appreciated by about 35% against the dollar since mid-2005.

A self-deprecating currency

The dollar’s depreciation over that period is, of course, bad for anyone holding American assets. But the dollar is not merely a store of value. It has also become a popular “funding” currency. Banks and multinational firms borrow in dollars, even as they accumulate assets in other denominations. Since no one wants to borrow in a currency that only goes up, this is not a role that China’s currency could easily play. Moreover, because of its role as a funding currency, the dollar tends to strengthen in times of crisis. That explains why emerging economies feel a “lumpy”, “unpredictable” need for dollars. America’s currency may not hold its value against others. But in times of stress, the appeal of a dollar asset is that it always holds its value against a dollar debt. The dollar is a global hegemon partly because it is also a global hedge. ■



Global warming

Who pressed the pause button?

The slowdown in rising temperatures over the past 15 years goes from being unexplained to overexplained

BETWEEN 1998 and 2013, the Earth's surface temperature rose at a rate of 0.04°C a decade, far slower than the 0.18°C increase in the 1990s. Meanwhile, emissions of carbon dioxide (which would be expected to push temperatures up) rose uninterrupted. This pause in warming has raised doubts in the public mind about climate change. A few sceptics say flatly that global warming has stopped. Others argue that scientists' understanding of the climate is so flawed that their judgments about it cannot be accepted with any confidence. A convincing explanation of the pause therefore matters both to a proper understanding of the climate and to the credibility of climate science—and papers published over the past few weeks do their best to provide one. Indeed, they do almost too good a job. If all were correct, the pause would now be explained twice over.

This is the opposite of what happened at first. As evidence piled up that temperatures were not rising much, some scientists dismissed it as a blip. The temperature, they pointed out, had fallen for much longer periods twice in the past century or so, in 1880-1910 and again in 1945-75 (see chart), even though the general trend was up. Variability is part of the climate system and a 15-year hiatus, they suggested, was not worth getting excited about.

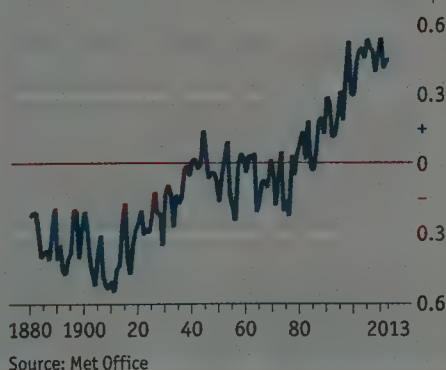
An alternative way of looking at the pause's significance was to say that there

had been a slowdown but not a big one. Most records, including one of the best known (kept by Britain's Meteorological Office), do not include measurements from the Arctic, which has been warming faster than anywhere else in the world. Using satellite data to fill in the missing Arctic numbers, Kevin Cowtan of the University of York, in Britain, and Robert Way of the University of Ottawa, in Canada, put the overall rate of global warming at 0.12°C a decade between 1998 and 2012—not far from the 1990s rate. A study by NASA puts the "Arctic effect" over the same period somewhat lower, at 0.07°C a decade, but that is still not negligible.

It is also worth remembering that aver-

A third pause

Global average temperature, $^{\circ}\text{C}$
Deviations from 1961-1990 mean



Source: Met Office

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age warming is not the only measure of climate change. According to a study just published by Sonia Seneviratne of the Institute for Atmospheric and Climate Science, in Zurich, the number of hot days, the number of extremely hot days and the length of warm periods all increased during the pause (1998-2012). A more stable average temperature hides wider extremes.

Still, attempts to explain away that stable average have not been convincing, partly because of the conflict between flat temperatures and rising CO_2 emissions, and partly because observed temperatures are now falling outside the range climate models predict. The models embody the state of climate knowledge. If they are wrong, the knowledge is probably faulty, too. Hence attempts to explain the pause.

Chilling news

In September 2013 the Intergovernmental Panel on Climate Change did so in terms of fluctuating solar output, atmospheric pollution and volcanoes. All three, it thought, were unusually influential.

The sun's power output fluctuates slightly over a cycle that lasts about 11 years. The current cycle seems to have gone on longer than normal and may have started from a lower base, so for the past decade less heat has been reaching Earth than usual. Pollution throws aerosols (particles such as soot, and suspended droplets of things like sulphuric acid) into the air, where they reflect sunlight back into space. The more there are, the greater their cooling effect—and pollution from Chinese coal-fired power plants, in particular, has been rising. Volcanoes do the same thing, so increased volcanic activity tends to reduce temperatures.

Gavin Schmidt and two colleagues at NASA's Goddard Institute quantify the ef- ►►

► fects of these trends in *Nature Geoscience*. They argue that climate models underplay the delayed and subdued solar cycle. They think the models do not fully account for the effects of pollution (specifically, nitrate pollution and indirect effects like interactions between aerosols and clouds). And they claim that the impact of volcanic activity since 2000 has been greater than previously thought. Adjusting for all this, they find that the difference between actual temperature readings and computer-generated ones largely disappears. The implication is that the solar cycle and aerosols explain much of the pause.

Blowing hot and cold

There is, however, another type of explanation. Much of the incoming heat is absorbed by oceans, especially the largest, the Pacific. Several new studies link the pause with changes in the Pacific and in the trade winds that influence the circulation of water within it.

Trade winds blow east-west at tropical latitudes. In so doing they push warm surface water towards Asia and draw cooler, deep water to the surface in the central and eastern Pacific, which chills the atmosphere. Water movement at the surface also speeds up a giant churn in the ocean. This pulls some warm water downwards, sequestering heat at greater depth. In a study published in *Nature* in 2013, Yu Kosaka and Shang-Ping Xie of the Scripps Institution of Oceanography, in San Diego, argued that much of the difference between climate models and actual temperatures could be accounted for by cooling in the eastern Pacific.

Every few years, as Dr Kosaka and Dr Xie observe, the trade winds slacken and the warm water in the western Pacific sloshes back to replace the cool surface layer of the central and eastern parts of the ocean. This weather pattern is called El Niño and it warms the whole atmosphere. There was an exceptionally strong Niño in 1997-98, an unusually hot year. The opposite pattern, with cooler temperatures and stronger trade winds, is called La Niña. The 1997-98 Niño was followed by a series of Niños, explaining part of the pause.

Switches between El Niño and La Niña are frequent. But there is also a long-term cycle called the Pacific Decadal Oscillation (PDO), which switches from a warm (or positive) phase to a cool (negative) one every 20 or 30 years. The positive phase encourages more frequent, powerful Niños. According to Kevin Trenberth and John Fasullo of America's National Centre for Atmospheric Research, the PDO was positive in 1976-98—a period of rising temperatures—and negative in 1943-76 and since 2000, producing a series of cooling Niños.

But that is not the end of it. Laid on top of these cyclical patterns is what looks like a one-off increase in the strength of trade

winds during the past 20 years. According to a study in *Nature Climate Change*, by Matthew England of the University of New South Wales and others, record trade winds have produced a sort of super-Niño. On average, sea levels have risen by about 3mm a year in the past 30 years. But those in the eastern Pacific have barely budged, whereas those near the Philippines have risen by 20cm since the late 1990s. A wall of warm water, in other words, is being held in place by powerful winds, with cool water rising behind it. According to Dr England, the effect of the trade winds explains most of the temperature pause.

If so, the pause has gone from being not explained to explained twice over—once by aerosols and the solar cycle, and again by ocean winds and currents. These two accounts are not contradictory. The processes at work are understood, but their relative contributions are not.

Nor is the answer to what is, from the human point of view, the biggest question of all, namely what these explanations imply about how long the pause might continue. On the face of it, if some heat is being sucked into the deep ocean, the process could simply carry on: the ocean has a huge capacity to absorb heat as long as the pump sending it to the bottom remains in working order. But that is not all there is to it. Gravity wants the western-Pacific water wall to slosh back; it is held in place only by exceptionally strong trade winds. If those winds slacken, temperatures will start to rise again.

The solar cycle is already turning. And aerosol cooling is likely to be reined in by China's anti-pollution laws. Most of the circumstances that have put the planet's temperature rise on "pause" look temporary. Like the Terminator, global warming will be back. ■

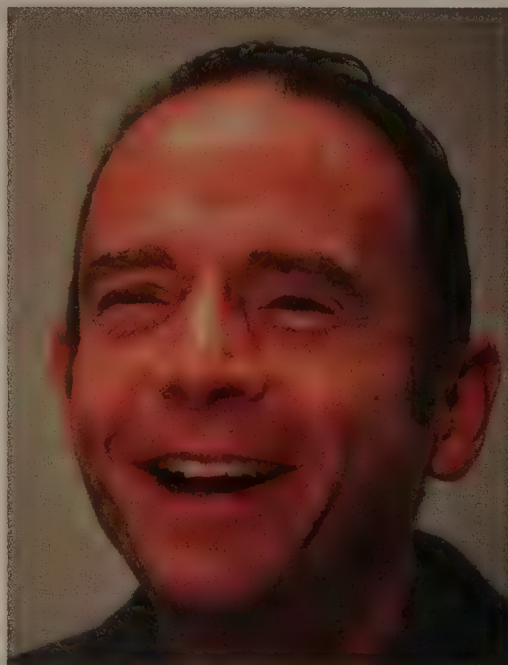
The search for a cure for AIDS

If it ain't broke...

...then break it

GENE therapy usually works by repairing a broken gene or creating a new one where none previously existed. Breaking a working gene to effect a cure is a novel approach. That, though, is what Carl June of the University of Pennsylvania and his colleagues are trying to do. As they explain in the *New England Journal of Medicine*, by damaging a gene called *CCR5* they hope to treat—and possibly cure—infection with HIV, the virus that causes AIDS.

CCR5 encodes a protein that sits on the



To your very good health, sir!

surface membranes of T-lymphocytes, cells which are part of the immune system. The protein's job is to latch onto signal molecules called chemokines. Unfortunately, it also latches onto strains of HIV, assisting their passage into the lymphocyte, where the virus then reproduces.

A consequence is that those whose *CCR5* genes are broken are immune to infection by these strains. Moreover, an HIV patient called Timothy Brown (pictured) who, in 2007 and 2008, had bone-marrow transplants from a donor with broken *CCR5* genes, has since been clear of HIV. The lymphocytes that came with the transplant seem to have taken over his immune system and the virus, with nowhere to reproduce, has vanished. Dr June therefore thought that if gene therapy could replace functional *CCR5* genes in T-lymphocytes with broken ones, other people already infected might be cured in a similar way.

He and his colleagues took T-lymphocytes from 12 infected people and tweaked the cells' *CCR5* genes using enzymes called zinc-finger nucleases. These enzymes recognise and cut particular sequences of the chemical bases of which DNA is composed. Those employed by Dr June were designed to snip *CCR5*. Even though a cell attempts to repair DNA so damaged, the fix is often imperfect. The team members were thus able to prepare T-lymphocytes with crooked *CCR5* genes which, they hoped, would be proof against HIV infec- ►

tion. They reinjected these, by the billion, into their volunteers.

The main purpose of this first, small-scale trial was to test the procedure's safety. It passed. One of the volunteers developed a fever, but that sometimes happens even after ordinary blood transfusions and did not seem abnormal. What really interested everyone, though, was whether the engineered lymphocytes might fend off HIV—and in one case it seems they did.

A month after the transfusion, when the tweaked cells had had a chance to bed down, six of the 12 volunteers stopped taking their antiretroviral drugs, to see what would happen. The engineered cells in these people survived much longer than did other immune cells, suggesting they were resisting infection. And in one of the six volunteers the virus seemed to vanish altogether, as it had done in Mr Brown. Twelve weeks after he stopped taking the drugs, the researchers could find no signs of HIV in his blood.

This individual turned out to be unusual, in that he had inherited a broken CCR5 gene from one of his parents. That made the nuclease's task easier, since only one copy of the gene per cell had to be disabled instead of the two copies (one from each parent) that most people have. And, because all the participants are now back on antiretrovirals, whether he would, like Mr Brown, have remained HIV-free indefinitely cannot be known. But his experience gives Dr June and his team hope that they might, possibly, have found a way to clobber a patient's HIV for good. ■

Virology

The Siberia strain

An exotic giant virus is thawed from the Russian tundra

IT SOUNDS like a film plot. A group of virus-hunting scientists get hold of a 32,000-year-old slab of Siberian permafrost. Overcome with curiosity, they thaw it, and, sure enough, something in the frozen soil wakes from its long slumber and begins infecting and killing test subjects left, right and centre.

But it is not a movie. It is, in fact, a scientific paper just published in *Proceedings of the National Academy of Sciences* by a team led by Jean-Michel Claverie of Aix-Marseille University, in France. Happily for humanity, the infected test subjects are amoebae, not people. As for the virus—a critter the researchers have dubbed *Pithovirus sibericum*—it is truly weird. It is the latest addition to a group of unusually large and complicated viruses that are confounding biologists' expectations of what a virus is supposed to be.

Viruses are supposed to be small and simple—little more than protein coats wrapped around just enough genes to hijack and subvert a cell, turning it into a factory for more viruses. HIV, for example, is 120 nanometres (billionths of a metre) across and it has 9,000 bases in its genome.

Things became more complicated in 2003 with the identification of *Mimivirus*, which infects a species of amoeba. Its genome, with more than 1m bases, is bigger than those of some bacteria. It is a physical giant, too, at 600 nanometres across. A group of virus hunters who spotted it in 1992 assumed something so big was a bacterium, and so did not investigate. Since 2003, several more giant viruses have been found, in places as diverse as the Pacific Ocean off Chile, a pond in Australia and a contact lens worn by a German woman. This suggests that although such viruses might be exotic, they are not that rare.

The most recent discovery is also the biggest, about 1,500 nanometres across. Genetically, though, it is less well-endowed, containing about 610,000 bases that collectively encode 467 proteins. (*Pandoravirus*, the present record-holder, sports a genome of more than 2m bases.)

One might assume from this that *Pithovirus* marks an evolutionary bridge between traditional viruses and the newly discovered behemoths. But that is not the case. Only a third of its proteins look like anything seen before, and their resemblance is to proteins produced by a diversity of other creatures: viruses, bacteria and even eukaryotes (organisms, such as amoebae and human beings, with complicated cells that sport a nucleus). It shares only five proteins with *Pandoravirus*, and to the extent it has any relatives the closest seem to be another family of big viruses called the *Marseilleviridae*.

What this intriguing mess does to the definition of a virus is a good question (such questions are why *Pandoravirus* was given that name). Viruses are often thought of as being on the far side of the dividing line between things that are alive and things that are not. Yet the giant viruses have longer genomes than some bacteria, which are indisputably alive. Some, including *Pithovirus*, possess complicated genetic machinery associated with protein synthesis that is not normally found in traditional viruses. With all this in mind some biologists have even argued that giant viruses deserve to be seen as their own, new, category of life.

In his paper, Dr Claverie is cautious, pointing out that only a few examples are known and that, besides being different from everything else, giant viruses also seem to be quite different from each other. He also points out that there is every reason to expect other viruses to be lurking, inactivated by the cold, in the permafrost. As climate change melts more of it, they might start to stir. The chance of anything emerging that is dangerous to people is low. (Few hominids made their homes in ice-age Siberia, so it would be hard for a virus harmful to modern humans to have evolved there.) But there could well be more exotic surprises to come. ■



Inflated ideas

This is not an alien spaceship. It is, rather, the longest aircraft in the world, floating in a hangar at Cardington airfield, in Britain. The Airlander 10, as it is known, is the latest attempt to revive airships as a practical means of transport. It is 92 metres long (8 metres more than an Antonov An-225, the previous record-holder), and is technically a hybrid. When flying, only 60% of its lift comes from the helium that inflates it. The other 40% comes from its aerodynamic shape. Its owner, Hybrid Air Vehicles, hopes it might be used to carry heavy equipment to out-of-the-way places, such as mining camps, that do not have runways for more conventional aircraft.

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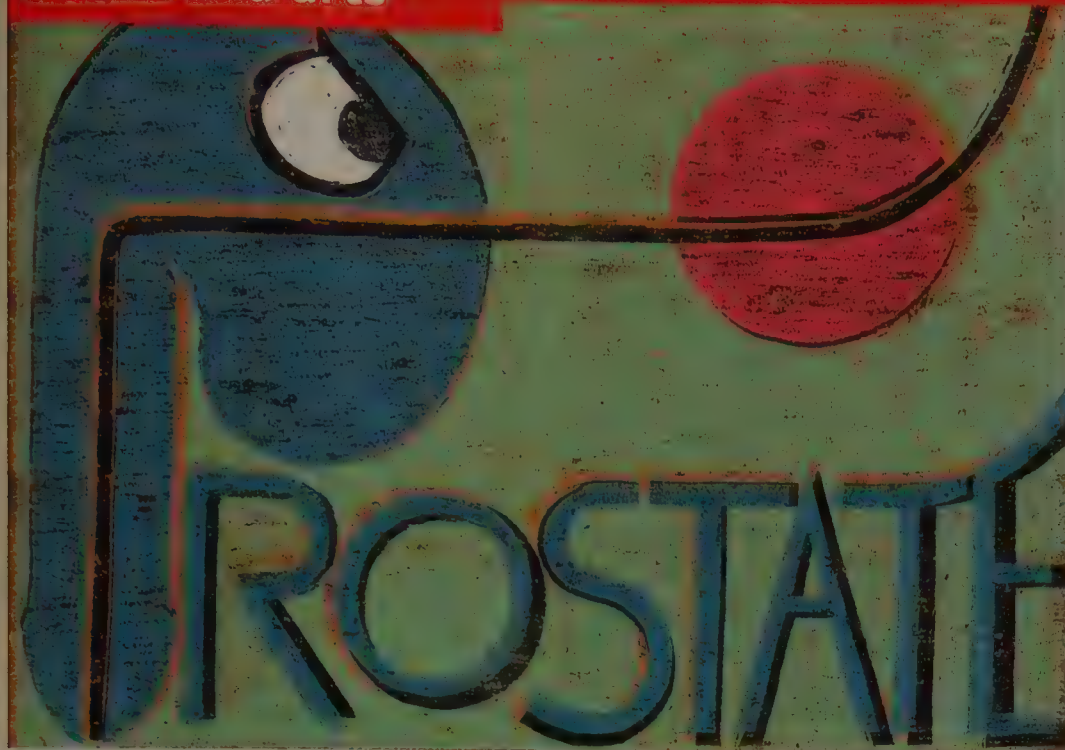
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Prostate cancer

Help or harm

The furious debate over screening for prostate cancer

CHANCES are that either you have prostate cancer or you know someone who does. One in three men aged between 40 and 60 has traces of it, with the risk rising as men grow older. Nearly 240,000 new cases were detected in America last year, more than any other type of cancer. Faced with such facts, any man would be forgiven for wanting to find the invader and impale it—by any means necessary.

There is a raging debate, however, over whether that is wise. Some doctors insist that testing for a protein called prostate-specific antigen (PSA) helps detect prostate cancer early, making it far less lethal. Others contend that PSA screening has prompted a barrage of needless treatment. Among those who believe it does more harm than good is Richard Ablin, the author of "The Great Prostate Hoax".

The prostate is a gland, about the size of a walnut, which helps make semen. It also makes the PSA protein. Mr Ablin, of the University of Arizona, claims to have been the first to identify PSA, though this is controversial. However, what matters is not who discovered it, but whether the protein provides any useful information. In some men with cancer, PSA levels may be elevated. But a high PSA does not necessarily mean that a man has cancer, nor does a low PSA mean he should be carefree.

Despite these shortcomings, the PSA test became common practice in the 1990s, particularly in America. In 1986 the Food

The Great Prostate Hoax: How Big Medicine Hijacked the PSA Test and Caused a Public Health Disaster. By Richard Ablin and Ronald Piana. *Palgrave MacMillan*; 262 pages; \$27

and Drug Administration approved the test to monitor those already diagnosed with cancer. In 1994 it went further, authorising the test to help detect cancer in men aged 50 and older. A level of four nanogrammes per millilitre (ng/ml) became the standard threshold for a high PSA. William Catalona of Northwestern University, who argued for the test's approval, admits that the cut-off of 4ng/ml was "completely arbitrary". He created a scatter plot from data of men's PSA levels and rates of cancer. "Just sort of eyeballing it, it looked like four would be a good number."

What followed was a frenzied hunt for tumours. In America there were mass screenings in offices, in car parks and shopping malls. This was, in itself, harmless. PSA screening involves a simple blood test. The crucial question was what doctors and patients did once armed with the test's imperfect information.

In the 1990s and early 2000s they did quite a lot. Doctors in America are rewarded for doing more procedures, so they often recommended biopsies to test for cancer. Almost 90% of cancers detected by PSA screening led to further treatment,

such as radiation and prostatectomies. But it is unclear exactly how many of these treated cancers were indolent, unlikely to spread beyond the prostate's lining.

Aggressive treatment can cause incontinence and impotence, which often lead people to seek yet further treatment, from penile implants to urinary cuffs. Attempts to avoid side effects have inspired new procedures, some of them of little value. Mr Ablin, and his co-author, Ronald Piana, are good at describing how the many ills of American health care—from doctors' fears of malpractice suits to their fascination with new gizmos—conspired to encourage treatment. But this is a flawed book. Mr Ablin races down tangential lines of argument, making hyperbolic charges. Are the proponents of the PSA test really as bad as tobacco companies?

At the very least, though, he highlights the importance of the debate over whether PSA screening has helped or hurt patients. Deaths from prostate cancer dropped by 45% between 1993 and 2010, suggesting that the test may have helped. But the number of deaths began declining before PSA screening would have had much effect; screenings may also have identified cancers that were never going to become lethal, artificially raising survival figures.

Critics of PSA testing, once regarded as heretics, have gained credibility recently, as a result of two big new studies. An American trial reported that PSA screening brought a tiny increase in mortality, relative to a control group. A large European trial reported moderate benefit only in those aged 55-69; screening saved about one man for every 1,000 men tested. These studies helped convince a government panel in America to recommend in 2012 that no man be screened for his PSA levels.

The recommendation sparked a furore. The American Urological Association ►►

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► (AUA) declared itself to be “outraged”. Critics such as Dr Catalona said the trials were flawed. Now different doctors, faced with the same data, are drawing dramatically different conclusions. The result is a hodge-podge of practices both within America and outside it.

Last year doctors and academics at the Prostate Cancer World Congress recommended screening for those aged 50-69; a baseline test for men in their 40s was declared “useful”. The AUA urges “shared decision making” about screening for men aged 55-69 and “individualised” decisions for younger men with a higher risk of cancer. Andrew Vickers of Memorial Sloan Kettering, a top cancer centre in New York, says that screening has historically been done “very stupidly” in America, but insists that the PSA test is valuable. Sloan Kettering urges that men aged 45-70 be tested, then consider a biopsy if their level is 3ng/ml or more.

Otis Brawley, chief medical officer of the American Cancer Society, points to one obvious problem: “there is no natural cut point” that distinguishes safe from unsafe levels. Better tests are needed, he argues. Screening needs to identify the genetic traits that make one cancer indolent and another lethal. Companies have begun to bring such tests to market. They may eventually remedy the current problem. Once cancer is detected, men are determined to root it out, even when it might be safer to watch and wait. The PSA frenzy grew out of an all too common pair of human characteristics: the wish to defeat cancer at any cost and the imperfect understanding of how it works. ■

English papists

In God we trust

God's Traitors: Terror and Faith in Elizabethan England. By Jessie Childs. *Bodley Head*; 443 pages; £25

AS EVERY English schoolboy knows, Queen Elizabeth I vowed “not to make windows into men’s hearts and secret thoughts”. According to government policy, an Englishman’s inner beliefs were a private matter. However, there is no evidence that Elizabeth actually said these words; the quote comes from her principal secretary, Francis Bacon. It is spin. Catholics were distrusted, spied on, harassed and penalised, often unjustly, as Jessie Childs’s excellent new book lays out.

Ms Childs, a British historian, examines one aristocratic family in the Midlands from 1570 to the gunpowder plot in 1605. The Vauxes were not only papists, they



More turbulent priests

were recusants—that is, they refused to go to church on Sundays with their fellow countrymen and stayed at home instead. To the queen’s more zealous pen-pushers, this could only mean treachery. Officials of her successor, James I, thought there had to be a link to the terrorist Guy Fawkes (Vaux was pronounced Vorks).

The climate of fear and suspicion was not without reason. In 1570 the pope declared that Roman Catholics should not obey the queen’s laws or commandments. Many assassination attempts were made on the monarch’s life. The most serious was in 1605, when Fawkes tried to blow up Parliament and wipe out London’s entire political elite in one blast.

The establishment reacted in each case by rushing out new laws and new offences. It was treason to question the queen’s right to rule. Emigration controls were passed. The import of papal bulls was quashed. Crosses, “hallowed” pictures and rosary beads were banned. Fines were imposed on non-attendance at church and on “the saying and hearing of Mass”. Stubborn English folk found small ways to register their protest. Roger Flamstead resolved to keep his hat on during prayers for the queen. Sir Richard Shireburn went to church but secretly blocked his ears with wool through the service.

Elizabeth was not too concerned with converting the nation, says Ms Childs. Fealty to England (and her rule) was more important than faith in any particular Church of England credo. She and her officials believed that Catholics would go through church rituals and keep up the pretence of belief. The problem was that Catholic belief could not easily be divorced from Catholic practices. To be papist, many thought, required a priest.

The government came to fear that Jesuit clerics were in cahoots with the pope. So

interacting with a foreign popish priest was made illegal, as was converting someone to Catholicism. The very act of “persuasion” was treason. The result? Priests were smuggled aboard ships dressed as sailors. They lodged in Catholic households like the Vauxes’ and conducted mass on the quiet. A secret network of undercover clergymen emerged, ready to flee in the middle of the night if necessary.

Priest-hunters launched dawn raids. One priest went on the run disguised as a jewel merchant; he admitted his costume was “very ridiculous”. Another was required to hide beneath a chimney for four days with nothing to eat but a couple of biscuits and some quince jam. Hidden compartments, trapdoors and fake walls proliferated. This was a time when an Englishman’s home was not his castle.

Ms Childs has written an engaging history of English papists, filled with memorable episodes. It poses a number of good questions about liberty and security. Was the Elizabethan state right to suppress certain freedoms? Catholics were certainly a threat to England. But cutting them from their pope, turning belief into treason, asking papists to choose between their queen and their god seems self-defeating. Enemies of the state tend to fight back. ■

Edmund White

The boy’s own story

Inside a Pearl: My Years in Paris. By Edmund White. *Bloomsbury*; 261 pages; \$26 and £18.99

IT IS perhaps best not to think of Edmund White’s latest volume of memoir as a book at all. Scattered, maddening, appealing, both bracingly candid (as Mr White always is) and curiously elliptical, it is a monologue, divided by convenience into chapters. But hidden at its heart is a touching and profound love story, one which Mr White, for the most part, has kept to himself until now.

The American writer and essayist moved to Paris in the summer of 1983, “armed with the success of a novel...and a Guggenheim fellowship for \$16,000”. He was meant to have the use of a flat on the Ile Saint-Louis for a few months. That stretched to six years, and he stayed in France until 1998. This period in Paris, and in other parts of France, has been memorialised in “Our Paris: Sketches from Memory” (1995), made with his lover Hubert Sorin, an architect and illustrator. Sorin’s winsome drawings enlivened that volume and his death from AIDS (when he was just 32) is touched on, both in this new book

Lorrie Moore's new fiction

Hearts of darkness

Bark. By Lorrie Moore. Knopf; 208 pages; \$24.95. Faber and Faber; £14.99

NO ONE is spared by the witty and biting Lorrie Moore in "Bark", her new collection of short stories. Not even God, "whose persistent mad humour was aimless as a gnat". Men are "walking caveat emptors". One character has such a distant relationship with her partner, but so craves human touch that she chooses a pat-down instead of the scanner at airport security.

"Bark" is Ms Moore's first collection since the soaring "Birds of America", which was published in 1998 and which spent five weeks on the *New York Times* bestseller list. Its eight stories, four of which have already appeared in the *New Yorker*, share a resonant sharpness as well as gloom. They mostly focus on the imminent destruction of relationships—if they are still intact at all. In "Wings", KC, a failed rocker, befriends a widower, while her relationship with her beau a few blocks away is dissolving. In "The Juniper Tree", one of the collection's briefest and

most powerful stories, a woman tries to cope with regret after her friend dies. It beautifully evokes the complications of female friendships.

Ms Moore's writing glides. She describes the mundane with precision and grace. The widower's "tea-stained teeth made a sepia smile". Ira, a recent divorcee, cannot take off his wedding ring, which is "cinched" by "the blousy fat of his finger". Ms Moore writes like a guest at a cocktail party holding court in the corner, sharing observant, acerbic comments about other guests. She manages to make everyone laugh.

Only when it veers towards politics does "Bark" become clunky. Tying plots and characters to Abu Ghraib or Barack Obama's re-election feels out of place in a world of unanchored characters, whose lostness is a function not of their nation's politics but of a deeper existential void. Still, "Bark" simultaneously honours and regrets the messiness of human relationships. Ms Moore is like one of her characters: "sternness in one eye and gentleness in the other".

and much more fully in Mr White's novel, "A Married Man". Indeed, so many of the elements in "Our Paris" are also to be found in "Inside a Pearl" (the genius of Azzedine Alaïa, a Tunisian designer, for example) that the reader might be forgiven for asking: what's new?

The answer to that lies in Mr White's evocation of the deep friendship that is at the heart of this book and which provides its opening lines: "I discovered France through Marie-Claude de Brunhoff." With her ivory cigarette-holder, she "gleamed like the inside of a nautilus shell". A decade older than Mr White, de Brunhoff had been a literary critic for *L'Express*, *Le Monde* and the *Quinzaine Littéraire*. She was married to Laurent de Brunhoff, who had taken over the writing of the famous Babar series of children's books from his father, Jean. Babar never meant much to Mr White: "I dimly remembered a monkey, and old lady, and of course all those elephants in green clothes wearing crowns." De Brunhoff's friendship, however, would be one of the great treasures of his life.

This book is filled—hectically so—with accounts of love affairs (the sex is generally less graphic than Mr White's readers have grown accustomed to; perhaps he is mellowing). There is also lots of gossip and some strident opinion. Much could have been pruned. Writing of his acquaintance

with Nigella Lawson, he tells the reader that "Nigella has sold hundreds of thousands of cookbooks, which contain her airy, lighthearted remarks." Nor does the world really need another description of the British secret service arriving to whisk Salman Rushdie away from Bruce Chatwin's funeral following the publication of "The Satanic Verses" and the resulting *fatwa*—certainly not in Mr White's rushed, blunt terms.

But the gossip and self-aggrandisement is laced with tenderness and truth. Mr White evokes the atmosphere of de Brunhoff's summer home on the Ile de Ré: the tidal beaches of the Atlantic coast and the wild hollyhocks around the house. And he evokes too the complicity of their friendship—she liked to think of the two of them as Madame de Merteuil and Valmont from "Les Liaisons Dangereuses". "There's one for you!" she would whisper when she saw a handsome young man.

Her death from cancer in 2000 is described briefly, abruptly. But then, as Mr White rightly says, thanks to the HIV epidemic which so devastated the gay community, he had already seen too much death to weep. "I was alive in order to—well, to teach, to trick, to write, to memorialise, to be a faithful scribe, to record the loss of my dead." And so he has done, once again. ■

Return of "Cosmos"

Starry-eyed

Remaking a scientific epic

CARL SAGAN, an American astronomer and one of the 20th century's great popularisers of science, had no time for TV snobs. He believed that television was a great educational tool. And he proved his theory in 1980 when he presented "Cosmos", a sweeping and lyrical account of the beauty of the universe, the history of civilisation, and the unparalleled power of science to illuminate reality.

The series was one of the most popular programmes ever made by America's Public Broadcasting System and was watched by more than half a billion people. The book that accompanied it has been classed by the Library of Congress as one of 88 books that shaped America's culture. Speak to scientists under 50—especially astronomers—and there is a good chance that they will admit that "Cosmos" was one reason they chose the career they did.

Perhaps the same will be true in another 30 years; the mode for reboots has caught up with "Cosmos". Fox, a big commercial network, has commissioned a remake that begins on March 9th. Sagan died in 1996. The new presenter is Neil deGrasse Tyson (pictured) an astronomer who runs New York's Hayden Planetarium.

Fans of the original will be happy that the new version takes a reverential approach. It begins with exactly the same shot: the presenter on the shores of the Pacific Ocean. The two big set pieces of the first episode—a journey through the universe in a computer-generated spaceship and a compression of the history of the universe into a single Earth year (all of recorded human history takes place in the ▶▶



Mr Universe

► final few seconds before midnight on December 31st)—were also in the original.

But there are changes, too. The original gave a potted history of astronomy back to the time of Eratosthenes, a Greek mathematician who correctly inferred the circumference of the Earth in 200BC by measuring the shadows cast by sticks on the summer solstice in Alexandria and Syene (now Aswan). The remake focuses on Giordano Bruno, a 16th-century Italian heretic who held (with no proof) that the sun was simply another star and that the universe was infinite and filled with other worlds.

And of course the science has moved on, too. In Sagan's time Pluto was still a planet; Dr Tyson gives a concise defence of the decision, in 2006, to downgrade it. Sagan could only speculate that other stars possessed planets of their own. Modern scientists have discovered thousands of them, implying that there are uncountable billions of other worlds scattered across our own galaxy alone.

Sagan was right. Used properly, television can educate and inspire awe as well as any book, painting or film. ■

Maria Schneider's classical jazz

No boundaries

NEW YORK

A daring composer defies categories

A SNUG one-bedroom flat near Manhattan's Central Park serves as home and studio to Maria Schneider, composer and bandleader. Her sister's abstract oils adorn the walls, and pots and pans hang from the ceiling of a tiny kitchen space that could fit in a cupboard. Her prized possession, a 29-year-old Yamaha upright piano, dominates the living room. When Ms Schneider composes, the idea for a new song can come to her in a flash. Or she can struggle for months to weave together a work worth performing.

"It can happen just when you're hitting your head against the wall because you can't come up with a solution," she says. "Then it can happen in the middle of the night when you're...just sitting there and sitting there and sitting there."

The agony and the eventual ecstasy of Ms Schneider's woodshedding sessions have yielded music that has altered the notion of what a modern jazz band can sound like. When her 19-member Maria Schneider Jazz Orchestra appears at New York's Jazz at Lincoln Centre later this month, the audience can expect to hear works that defy categorisation. One moment, the group can be freewheeling and jazzy. A song or two later, it glides with ease



Here she comes

through Ravel- or Chopin-like movements. Then a chamber-music-style duet can seize the spotlight while the rest of the musicians sit in silence.

Ms Schneider's daring compositions have helped her to elbow her way onto the list of jazz's finest living composers. In 2012 the influential annual poll of critics in *DownBeat*, a jazz magazine, bestowed upon Ms Schneider triple-treat status as the genre's best big-band leader, arranger and composer. Those who have knocked on her door requesting commissioned works include the Los Angeles Philharmonic Association and the Danish Radio Orchestra. Among the oddest non-musical requests came from a wine producer in Germany who asked her to select the grapes for a wine that now bears her name—the Reichsrat von Buhl Maria Schneider Jazz Riesling.

Ms Schneider stunned the classical music world in January, when her 2013 recording, "Winter Morning Walks", won three Grammy Awards, including one for best contemporary classical composition. The project set verse from a collection by Ted Kooser, a former poet laureate in America, to music. The poems, from "Winter Morning Walks: 100 Post Cards to Jim Harrison", document his reflections on life and nature while he was recovering from cancer treatment.

Ms Schneider and the Iowa-born Mr Kooser are both Midwesterners, and from adjoining states. Like the poet, Ms Schneider has also had cancer. To interpret the verses musically, the composer pinned two dozen of the poems she liked most above her piano and brainstormed melodies. In one, "Walking by Flashlight", she found images and reflections that were less about cancer and more about nature:

Walking by flashlight
at six in the morning
my circle of light on the gravel
swinging side to side, coyote, raccoon,
field mouse, sparrow
each watching from darkness
this man with the moon on a leash.

Ms Schneider's journey to band leader began in the tiny farm town of Windom, Minnesota. A local music teacher, Evelyn Butler, introduced her to the piano when she was five years old. By the age of eight, she had written her first song. Becoming an instrumentalist, though, did not seem to be in the stars. She tried her hand at the clarinet, and was a "horrible" violin player. She also struggled as a youngster to play trills on the piano. "I'm not a performer," Ms Schneider says. "That's just not the animal that I am."

After studying music at the University of Minnesota and the Eastman School of Music, she decided that band leading and composing were her calling. She moved to New York and became an assistant to Gil Evans, who had arranged music for some of Miles Davis's recordings. At the same time, she was seeking ways to create her own voice and vision for an orchestra. "Evanesence" (1994) showcases her skill at writing gorgeous melodies for horns and shifting moody harmonies.

Ms Schneider also went her own way when she dumped the traditional record labels and signed on with ArtistShare, a New York-based digital-record label that distributes its music only on the internet. A record label usually foots the bill for the recording's cost and takes the lion's share of its profits. Instead, Ms Schneider raises the money from fans in exchange for giving them a behind-the-scenes view of the recording process or a credit as a producer. She made history when a 2004 recording, "Concert in the Garden", became the first digital download-only CD to win a Grammy award.

Ms Schneider's first priority is making music that moves her listeners, though attracting more donors for her recordings would help. "Winter Morning Walks" cost about \$200,000 to produce, which is pricey by jazz standards. "The only thing I'm concerned about is whether the listeners are brought out of their worries, and if the music reminds them how beautiful life can be," Ms Schneider says. "It's a tall order." ■



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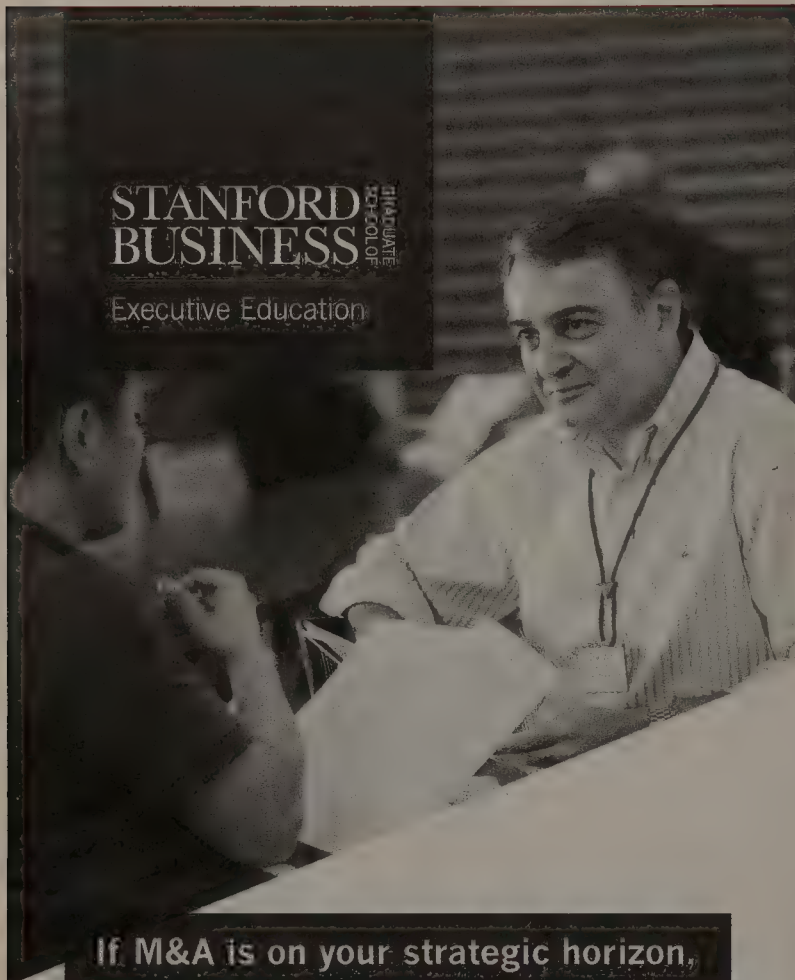
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Literary Works in Electronic Databases Copyright Litigation

**To: Freelance authors of
English language literary works**

This is a summary notice of a revised class action settlement. Please read this notice. It may affect your legal rights.

What is this proposed settlement about?

A settlement has been reached in a class action lawsuit alleging that commercial electronic databases and newspapers and magazines infringed the copyrights of freelance authors. The lawsuit alleges that newspapers and magazines, after publishing the works with the authors' permission, then sold them to the electronic databases without the authors' permission. The current settlement is a revision of a previous proposed settlement that was reached in 2005.

The settlement applies to English language literary works that were reproduced on a commercial electronic database without the authors' permission. Works may still be eligible even if not registered with the U.S. Copyright Office, and even if they were originally published outside the U.S. Excluded are works for hire and works for which the author granted electronic rights to the original publisher.

Freelance authors were notified of the previous settlement, and the deadline for submitting compensation claims under that settlement was September 30, 2005. Additional details about eligible works and your options are contained in the full Notice of Revised Class Action Settlement, available at www.copyrightclassaction.com.

What do I need to do?

Class members have three options: (i) do nothing; (ii) exclude yourself from the settlement; (iii) object to the settlement.

To remain a class member, you do not need to do anything. **To be eligible for a settlement payment, you must have already submitted a timely, valid claim under the previous settlement in 2005.** If you did so, then you need to do nothing further to participate in the settlement. (You will eventually hear from the Claims Administrator about the validity of your claim.)

You may still exclude yourself from the settlement. You must (1) mail a written request for exclusion, postmarked by May 9, 2014, *Electronic Databases Copyright Litigation*, EXCLUSION REQUEST, c/o GCG, PO Box 10033, Dublin, OH 43017-6633, **or** (2) submit an exclusion request online at www.copyrightclassaction.com by that date.

To object to the settlement, you must file a written objection by May 9, 2014.

Further information on each option is available at www.copyrightclassaction.com.

Final Fairness Hearing

A hearing on the proposed settlement will be held June 10, 2014 at 10:00 a.m. by U.S. District Judge George B. Daniels, U.S. District Court, 500 Pearl Street, New York, NY 10007, to determine whether the settlement should be approved. Class members or their counsel may appear in Court.

I have new contact information, whom should I contact?

If you have changed your mailing or e-mail address since the original settlement in 2005, you should notify the Claims Administrator, whose contact information is in the full Notice of Revised Class Action Settlement. If the Claims Administrator does not have your correct contact information, you may not receive your settlement payment (assuming you already submitted a valid claim in 2005) or notice of important developments in this class action.


Please do not contact the Court.

Dated: January 22, 2014

By Order of the Court
The Honorable George B. Daniels

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For every child
Health, Education, Equality, Protection
ADVANCE HUMANITY

unicef 

Invitation for REQUEST FOR PROPOSAL Nr. ETH-2014-9110624

UNICEF Ethiopia Office is seeking Request for Proposals from international consultancy companies in association with qualified local consultancy companies specialized in Urban Water and Sanitation Construction Engineering Design & Management **"to Design and Supervise Urban Water Supply, Sanitation and Climate Resilience works in 8 Towns and 40 Villages in Amhara, Oromia, Somali and Tigray Regions of Ethiopia"**.

The main objectives of the consultancy is to a) Conduct sanitation feasibility studies/develop master plans; b) Conduct Water Supply Feasibility Studies for 6 towns and at least 40 satellite villages c) Supervision of construction works.

Interested and eligible bidders are invited to collect the complete tender documents by sending an email to Mr. Sebastian Muzuma (smuzuma@unicef.org) or Mr. Deresse Damte (ddamte@unicef.org) starting from **10-March-2014 (Monday)**. Proposals are to be submitted to UNICEF Ethiopia Office on or before **11.00 am (East African Time) 4th April 2014 (Friday)**. Please quote the RFP nr. 9110624 in all your correspondences. Due to the nature of the bid, there will be no bid public opening for this offer. UNICEF reserves the right to accept or reject part or all of any or all bids.

ADDRESS: UNICEF ETHIOPIA, Supply Section, Room 112, Attn. Mr. Sebastian Muzuma / Mr. Deresse Damte, P.O.BOX 1169, TEL: +251-11 518 4233 / 4167, Addis Ababa, Ethiopia.

**एनटीपीसी
NTPC**

NTPC Limited
(A Govt. of India Enterprise)

Expression of Interest (EOI)
From State Electricity Boards/Power Generation Companies,
Independent Power Producers (IPP),
Power Plant Developers, Captive Power Producers, or their authorised
representatives for "Offering their coal based thermal power projects for
possible acquisition by NTPC"

EOI No.: BD/M&A/01

Dated: 21.02.2014

1.0 Introduction:

India's largest power company, NTPC has an installed capacity of 42464 MW comprising of 22 coal based and 8 gas based projects. NTPC has massive ongoing capacity addition plans with around 20000 MW projects under construction. The company is also contemplating increasing its generation assets by means of acquisition of coal based power projects in India and abroad.

2.0 Expression of Interest:

Expression of Interest is invited from State Electricity Boards/Power Generation Companies, Independent Power Producers, Power Plant Developers, Captive Power Producers, or their Authorised Representatives for offering their Operational/Commissioned/Synchronised/Under Construction/under Planning Coal Based Thermal Power Projects (based on domestic, imported as well as mix of domestic and imported coal) in India and abroad having requisite land, firm fuel and water linkages, statutory clearances and Power Purchase Agreement (PPA) in place for acquisition by NTPC.

3.0 Purpose of Inviting EOI:

Through this EOI, NTPC intends to identify the suitable Power Projects, as specified in Clause 2.0 above, to carry out preliminary due diligence and shortlist these projects which qualify for carrying out detailed due diligence for a possible acquisition.

4.0 Last date of Submission:

Last date of submission of EOI is 7th April, 2014

Interested parties may refer to the detailed NIT conditions available on our website www.ntpctender.com or may contact AGM (BD) on Phone No. +91-11-24369551.

Power of India

01/CC/12/2013-14

R.K. SWAMY BDO

Economic data

% change on year ago

	Gross domestic product			Industrial production	Consumer prices		Unemployment	Current-account balance		Budget balance	Interest rates, %	Currency units, per \$	
	latest	qtr*	2014†	latest	latest	2014†	rate, %	latest 12 months, \$bn	% of GDP 2014†	% of GDP 2014†	10-year gov't bonds, latest	Mar 5th	year ago
United States	+2.5 Q4	+2.4	+2.8	+2.9 Jan	+1.6 Jan	+1.6	6.6 Jan	-398.7 Q3	-2.2	-2.9	2.69	-	-
China	+7.7 Q4	+7.4	+7.2	+9.7 Dec	+2.5 Jan	+2.8	4.1 Q4§	+188.6 Q4	+1.7	-1.9	4.24§§	6.14	6.22
Japan	+2.7 Q4	+1.0	+1.4	+10.6 Jan	+1.4 Jan	+2.5	3.7 Jan	+34.4 Dec	+0.9	-7.3	0.62	102	93.3
Britain	+2.7 Q4	+2.9	+2.8	+1.8 Dec	+1.9 Jan	+2.0	7.2 Nov††	-94.9 Q3	-3.2	-5.6	2.87	0.60	0.66
Canada	+2.7 Q4	+2.9	+2.3	+2.7 Dec	+1.5 Jan	+1.5	7.0 Jan	-58.9 Q4	-2.9	-2.2	2.48	1.11	1.03
Euro area	+0.5 Q4	+1.1	+1.1	+0.5 Dec	+0.8 Feb	+0.9	12.0 Jan	+288.7 Dec	+2.1	-2.6	1.61	0.73	0.77
Austria	+0.9 Q4	+2.1	+1.3	-0.6 Dec	+1.5 Jan	+1.7	4.9 Jan	+9.6 Q3	+2.9	-2.8	1.89	0.73	0.77
Belgium	+1.0 Q4	+2.0	+1.2	-0.4 Dec	+1.0 Feb	+1.2	8.5 Jan	-12.6 Sep	-0.5	-2.9	2.24	0.73	0.77
France	+0.8 Q4	+1.2	+0.8	+0.5 Dec	+0.7 Jan	+1.1	10.9 Jan	-42.0 Dec	-1.7	-3.6	2.17	0.73	0.77
Germany	+1.4 Q4	+1.5	+1.8	+2.9 Dec	+1.2 Feb	+1.4	6.8 Feb	+267.6 Dec	+6.6	+0.3	1.61	0.73	0.77
Greece	-2.6 Q4	na	nil	+0.4 Dec	-1.5 Jan	-1.0	28.0 Nov	+1.6 Dec	+1.6	-2.5	6.83	0.73	0.77
Italy	-0.8 Q4	+0.5	+0.4	-0.7 Dec	+0.5 Feb	+0.8	12.9 Jan	+16.2 Dec	+0.8	-3.3	3.37	0.73	0.77
Netherlands	+0.7 Q4	+2.8	+0.8	+1.8 Dec	+1.4 Jan	+1.2	8.6 Jan	+83.6 Q3	+9.5	-3.4	1.83	0.73	0.77
Spain	-0.1 Q4	+0.7	+0.7	+3.5 Dec	+0.2 Jan	+0.4	25.8 Jan	+9.5 Dec	+1.1	-5.9	3.43	0.73	0.77
Czech Republic	-0.3 Q3	+6.6	+1.6	+9.3 Dec	+0.2 Jan	+1.5	8.6 Jan§	-3.4 Q3	-0.6	-3.6	2.21	19.9	19.7
Denmark	+0.6 Q4	-2.0	+1.3	-0.7 Dec	+1.0 Jan	+1.4	5.4 Jan	+23.9 Dec	+6.1	-1.8	1.65	5.43	5.72
Hungary	+2.7 Q4	+2.2	+2.1	+4.6 Dec	nil Jan	+1.4	8.9 Jan§††	+3.1 Q3	+1.9	-3.0	5.81	226	229
Norway	+1.1 Q4	-0.7	+2.2	+1.3 Dec	+2.3 Jan	+2.1	3.6 Dec††	+54.5 Q4	+12.5	+12.0	2.87	6.01	5.71
Poland	+2.7 Q4	na	+2.9	+4.1 Jan	+0.7 Jan	+1.5	14.0 Jan§	-7.9 Dec	-1.8	-3.5	4.26	3.05	3.17
Russia	+1.2 Q3	na	+2.9	-0.2 Jan	+6.2 Feb	+5.8	5.6 Jan§	+33.0 Q4	+1.9	-0.5	8.69	36.1	30.7
Sweden	+3.1 Q4	+7.1	+2.3	+0.8 Jan	-0.2 Jan	+0.7	8.6 Jan§	+34.6 Q4	+6.0	-1.4	2.19	6.45	6.39
Switzerland	+1.7 Q4	+0.6	+2.1	+0.7 Q3	+0.1 Jan	+0.4	3.2 Jan	+79.9 Q3	+11.4	+0.5	0.96	0.89	0.94
Turkey	+4.4 Q3	na	+2.0	+6.9 Dec	+7.9 Feb	+10.1	9.9 Nov§	-65.0 Dec	-6.6	-2.7	10.58	2.21	1.79
Australia	+2.8 Q4	+3.2	+2.6	+2.8 Q4	+2.7 Q4	+2.7	6.0 Jan	-44.2 Q4	-3.2	-2.8	4.06	1.11	0.97
Hong Kong	+3.0 Q4	+4.4	+3.7	-0.9 Q3	+4.6 Jan	+3.6	3.1 Jan††	+5.4 Q3	+2.8	+1.3	2.28	7.76	7.76
India	+4.7 Q4	+0.4	+6.0	-0.6 Dec	+8.8 Jan	+8.8	9.9 2012	-49.2 Q4	-2.9	-4.9	8.84	62.0	54.9
Indonesia	+5.7 Q4	na	+5.4	+0.6 Dec	+7.7 Feb	+7.0	5.8 Q4§	-28.5 Q4	-3.8	-2.3	na	11,595	9,693
Malaysia	+5.1 Q4	na	+5.1	+4.8 Dec	+3.4 Jan	+3.2	3.0 Dec§	+11.7 Q4	+5.3	-4.2	4.12	3.28	3.10
Pakistan	+6.1 2013**	na	+3.9	+13.2 Dec	+7.9 Feb	+7.2	6.2 2013	-4.0 Q4	-1.6	-6.3	12.85†††	105	98.1
Singapore	+5.5 Q4	+6.1	+4.2	+3.9 Jan	+1.4 Jan	+2.7	1.8 Q4	+54.4 Q4	+19.5	+0.7	2.44	1.27	1.25
South Korea	+4.0 Q4	+3.7	+3.3	-3.8 Jan	+1.0 Feb	+2.0	3.5 Jan§	+72.0 Jan	+4.4	+0.5	3.57	1,073	1,087
Taiwan	+2.9 Q4	+7.3	+3.2	-1.8 Jan	nil Feb	+1.1	4.1 Jan	+57.4 Q4	+10.2	-2.1	1.61	30.3	29.7
Thailand	+0.4 Q4	+2.4	+3.0	-7.4 Jan	+2.0 Feb	+2.4	0.6 Dec§	-2.8 Q4	+0.6	-2.6	3.56	32.5	29.8
Argentina	+5.5 Q3	-0.7	-0.6	-2.6 Jan	— ***	—	6.4 Q4§	-3.5 Q3	-0.2	-2.4	na	7.89	5.06
Brazil	+1.9 Q4	+2.8	+1.8	-2.3 Dec	+5.6 Jan	+6.0	4.8 Jan§	-81.6 Jan	-3.6	-4.0	12.69	2.34	1.97
Chile	+4.7 Q3	+5.4	+4.1	-1.7 Jan	+2.8 Jan	+3.2	6.1 Jan§††	-9.5 Q3	-4.2	-1.0	5.02	559	473
Colombia	+5.1 Q3	+4.5	+4.7	+2.0 Dec	+2.3 Feb	+2.7	11.1 Jan§	-12.6 Q3	-3.5	-0.7	7.27	2,048	1,809
Mexico	+0.7 Q4	+0.7	+3.0	-0.3 Dec	+4.5 Jan	+4.5	4.8 Jan	-22.3 Q4	-1.6	-3.2	7.75	13.3	12.7
Venezuela	+1.1 Q3	-0.8	-1.8	+0.8 Sep	+56.2 Jan	+65.2	5.6 Dec§	+6.9 Q3	+1.7	-12.2	12.77	6.29	6.29
Egypt	+1.0 Q3	na	+2.0	-18.1 Dec	+11.3 Jan	+9.9	13.4 Q4§	-4.5 Q3	-2.4	-12.7	na	6.96	6.74
Israel	+3.5 Q4	+2.3	+3.4	+7.4 Dec	+1.4 Jan	+1.5	5.9 Jan	+3.3 Q3	+2.5	-2.8	3.47	3.49	3.73
Saudi Arabia	+3.8 2013	na	+4.0	na	+2.9 Jan	+3.3	5.6 2013	+139.3 Q3	+13.0	+1.7	na	3.75	3.75
South Africa	+2.0 Q4	+3.8	+2.5	+2.6 Dec	+5.8 Jan	+5.6	24.1 Q4§	-22.1 Q3	-6.3	-4.4	8.45	10.8	9.06

Source: Haver Analytics. **% change on previous quarter, annual rate. †The Economist poll or Economist Intelligence Unit estimate/forecast. §Not seasonally adjusted. ‡New series. **Year ending June. ††Latest 3 months. †‡3-month moving average. §§5-year yield ***Official number not yet proven to be reliable; The State Street PriceStats Inflation Index, December 23.38%; year ago 25.98% †††Dollar-denominated bonds.



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Markets

	Index Mar 5th	% change on		
		one week	Dec 31st 2013 in local currency terms	in \$ terms
United States (DJIA)	16,360.2	+1.0	-1.3	-1.3
China (SSEA)	2,149.2	+0.6	-2.9	-4.1
Japan (Nikkei 225)	14,897.6	-0.5	-8.6	-6.1
Britain (FTSE 100)	6,775.4	-0.3	+0.4	+1.4
Canada (S&P TSX)	14,304.2	+0.8	+5.0	+0.9
Euro area (FTSE Euro 100)	1,028.1	-0.5	+0.8	+0.5
Euro area (EURO STOXX 50)	3,136.0	-0.4	+0.9	+0.6
Austria (ATX)	2,545.7	-4.9	nil	-0.3
Belgium (BEL 20)	3,108.1	+1.7	+6.3	+6.0
France (CAC 40)	4,391.3	-0.1	+2.2	+1.9
Germany (DAX)*	9,542.0	-1.2	-0.1	-0.4
Greece (Athex Comp)	1,319.6	+1.2	+13.5	+13.2
Italy (FTSE/MIB)	20,757.0	+1.8	+9.4	+9.1
Netherlands (AEX)	398.6	nil	-0.8	-1.1
Spain (Madrid SE)	1,044.3	nil	+3.2	+2.9
Czech Republic (PX)	1,004.7	-1.5	+1.6	+1.3
Denmark (OMXCBO)	658.5	+0.2	+16.3	+16.0
Hungary (BUX)	17,471.8	-1.8	-5.9	-10.0
Norway (OSEAX)	615.0	+0.9	+2.0	+3.3
Poland (WIG)	52,216.1	-1.4	+1.8	+0.8
Russia (RTS, \$ terms)	1,182.1	-8.1	-10.0	-18.1
Sweden (OMXS30)	1,364.9	-0.6	+2.4	+2.3
Switzerland (SMI)	8,459.6	-0.9	+3.1	+3.4
Turkey (BIST)	63,444.7	+3.2	-6.4	-8.8
Australia (All Ord.)	5,457.3	+0.2	+1.9	+2.7
Hong Kong (Hang Seng)	22,579.8	+0.6	-3.1	-3.2
India (BSE)	21,276.9	+1.4	+0.5	+0.8
Indonesia (JSX)	4,659.2	+2.8	+9.0	+14.5
Malaysia (KLSE)	1,829.1	+0.4	-2.0	-1.9
Pakistan (KSE)	26,522.0	+4.0	+5.0	+5.8
Singapore (STI)	3,116.6	+0.9	-1.6	-2.1
South Korea (KOSPI)	1,971.2	nil	-2.0	-3.4
Taiwan (TWI)	8,632.9	+0.4	+0.2	-1.3
Thailand (SET)	1,351.6	+3.6	+4.1	+5.8
Argentina (MERV)	5,749.8	-1.3	+6.7	-11.8
Brazil (BVSP)	46,589.0	nil	-9.5	-8.9
Chile (IGPA)	18,339.5	+1.1	+0.6	-6.0
Colombia (IGBC)	12,734.0	+4.7	-2.6	-8.0
Mexico (IPC)	39,021.1	+1.1	-8.7	-9.7
Venezuela (IBC)	2,743.8	-0.9	+0.3	na
Egypt (Case 30)	8,025.3	+0.3	+18.3	+18.1
Israel (TA-100)	1,270.0	+1.3	+5.2	+4.7
Saudi Arabia (Tadawul)	9,161.3	+1.1	+7.3	+7.3
South Africa (JSE AS)	47,514.8	+1.1	+2.7	+0.5

The Economist poll of forecasters, March averages (previous month's, if changed)

	Real GDP, % change				Consumer prices % change		Current account % of GDP	
	Low/high range		average					
	2014	2015	2014	2015	2014	2015	2014	2015
Australia	2.0/3.0	2.5/3.4	2.6 (2.7)	2.9	2.7 (2.6)	2.5	-3.2 (-3.4)	-3.0
Belgium	0.9/1.4	0.8/1.6	1.2	1.3	1.2 (1.3)	1.6	-0.5 (-0.8)	-0.3
Britain	2.4/3.3	1.8/3.2	2.8 (2.7)	2.5	2.0 (2.2)	2.1	-3.2 (-3.1)	-2.9
Canada	2.0/2.6	2.2/3.1	2.3 (2.4)	2.6	1.5	1.9	-2.9	-2.6
France	0.4/1.5	0.7/1.9	0.8 (0.7)	1.2	1.1 (1.2)	1.3	-1.7 (-1.8)	-1.6
Germany	1.4/2.1	1.3/2.3	1.8 (1.7)	1.9	1.4 (1.5)	1.8	6.6 (6.5)	6.2
Italy	0.2/0.8	0.3/1.6	0.4	0.9	0.8 (0.9)	1.1	0.8	1.0
Japan	1.0/1.8	0.9/1.7	1.4 (1.6)	1.3	2.5 (2.3)	1.7	0.9 (1.1)	1.0
Netherlands	0.1/1.5	0.6/1.8	0.8 (0.6)	1.2	1.2 (1.3)	1.7	9.5 (9.9)	9.4
Spain	nil/1.0	0.9/1.7	0.7 (0.6)	1.2	0.4 (0.5)	1.0	1.1 (1.5)	1.8
Sweden	1.4/3.6	2.1/3.5	2.3 (2.2)	2.8	0.7 (1.1)	1.8	6.0 (5.9)	6.2
Switzerland	1.7/2.4	1.8/2.8	2.1 (2.0)	2.3	0.4 (0.5)	0.9	11.4 (11.8)	11.3
United States	2.2/3.5	2.3/3.3	2.8 (2.9)	2.9	1.6 (1.7)	1.9	-2.2	-2.2
Euro area	0.6/1.4	1.0/2.1	1.1 (1.0)	1.5	0.9 (1.0)	1.3	2.1 (1.9)	2.2

Sources: Bank of America, BNP Paribas, Citigroup, Commerzbank, Decision Economics, Deutsche Bank, Economist Intelligence Unit, Goldman Sachs, HSBC Securities, ING, JPMorgan Chase, KBC Bank, Morgan Stanley, RBC, RBS, Schroders, Scotia Capital, Société Générale, Standard Chartered, UBS

Other markets

	Index Mar 5th	% change on		
		one week	Dec 31st 2013 in local currency terms	in \$ terms
United States (S&P 500)	1,873.8	+1.6	+1.4	+1.4
United States (NASComp)	4,358.0	+1.5	+4.3	+4.3
China (SSEB, \$ terms)	234.3	+2.6	-6.5	-7.6
Japan (Topix)	1,212.9	-1.0	-6.9	-4.3
Europe (FTSEurofirst 300)	1,344.0	-0.4	+2.1	+1.8
World, dev'd (MSCI)	1,679.1	+0.9	+1.1	+1.1
Emerging markets (MSCI)	959.2	+0.3	-4.3	-4.3
World, all (MSCI)	410.6	+0.8	+0.5	+0.5
World bonds (Citigroup)	930.2	+0.4	+2.6	+2.6
EMBI+ (JPMorgan)	665.0	+0.9	+2.0	+2.0
Hedge funds (HFRX)	1,243.8 ^s	+0.5	+1.5	+1.5
Volatility, US (VIX)	13.9	+14.4	+13.7 (levels)	
CDSs, Eur (iTRAXX) [†]	71.7	-1.3	+3.5	+3.2
CDSs, N Am (CDX) [†]	62.4	-4.3	+4.5	+4.5
Carbon trading (EU ETS) €	6.9	+4.4	+36.6	+36.2

Sources: Markit; Thomson Reuters. ^sTotal return index. [†]Credit-default-swap spreads, basis points. [‡]Mar 4th.

Indicators for more countries and additional series, go to: Economist.com/indicators

The Economist commodity-price index

2005=100

			% change on	
	Feb 25th	Mar 4th*	one month	one year
Dollar Index				
All Items	170.4	172.9	+5.7	-5.7
Food	195.5	200.1	+8.5	-3.8
Industrials				
All	144.3	144.6	+2.0	-8.3
Nfa [†]	152.8	154.8	+2.8	-7.7
Metals	140.7	140.1	+1.6	-8.6
Sterling Index				
All items	185.8	188.6	+3.3	-14.5
Euro Index				
All items	154.3	156.4	+3.9	-10.6
Gold				
\$ per oz	1,341.0	1,337.0	+6.9	-15.2
West Texas Intermediate				
\$ per barrel	102.0	103.2	+6.0	+13.6

Sources: Bloomberg; CME Group; Cotlook; Darmann & Curl; FT; ICCO; ICO; ISO; Live Rice Index; LME; NZ Wool Services; Thompson Lloyd & Ewart; Thomson Reuters; Urner Barry; WSJ. *Provisional
[†]Non-food agricultural.

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Geno Germano, *President, General Manager Speciality Care and Oncology, Pfizer*

Ulf Wiinberg, *Chief Executive Officer, Lundbeck*

Bruno Strigini, *President Europe and Canada, Merck Sharp & Dohme*

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20TH
ANNIVERSARY
1994 - 2014



Mike Parker

Mike Parker, typographer, died on February 23rd, aged 84

WHAT is the basis of civilisation? Some would say wheat; others, the taming of fire. Mike Parker would say, type. That little 15th-century typefounder's mould, made of brass, ready to take the hot lead that would cool into the letter-shape punched in the matrix, had helped people to read, and so had changed the way they thought and acted. The Bible printed by Gutenberg around 1455, in that wonderful blackletter whose spacing of exquisitely planed type had never been bettered, had broken the hold of the church and opened the way to modern commerce. What could be more world-changing than that?

The little mould was one of the treasures he had found when he was tasked in 1958 to sort out the typefounders' artefacts at the Plantin-Moretus museum in Antwerp. Hooked on the subject already, with a master's from Yale on the types of Garamond, he now fell in love. From the dusty printing house he unearthed the unsurpassed 16th-century romans of Hendrik van den Keere, the ancestors of modern newspaper typeface and Poynter Oldstyle; the dancing baroque types of Robert Granjon, especially his Galliard, from which Mr Parker and his designer-colleague, Matthew Carter, developed a fresh version; and, tight-wrapped, still brand-new bright, the large Rotunda types cut for a never-

printed antiphony for Philip II of Spain.

For any type you could think of, Mr Parker knew the back-story. In his early years as director of type development at the Linotype typesetting company, where he stayed from 1959 until 1981, he walked around, a vigorous, booming figure, with his catalogue of the Plantin fonts under his arm—each specimen photographed with the light shining obliquely off the faces of the letters. Designers, he hoped, would look and imitate.

He did not draw the designs himself, though he had dreams of being an artist once. His job was to assess the spacing, shape, elegance and potential of the drawn types, and develop them. This was a subject he could expound on for hours, day or night, face to face, on the phone, or while devouring one of the five-alarm Korean stews he had acquired a taste for on his army service. Until he met his first wife, the upper-case Women in his Life all came from the world of typography.

A font for all seasons

His job at Linotype was also to build up a proper library of fonts for customers to order. He expanded the range from 150 to 1,500, cloning and adapting as necessary. This was standard industry behaviour, evolving as the different foundries and

typesetting companies had competed for customers, designers and popular fonts down the years. Mr Parker could be a rascal with the rest: softening up Mr Carter, for example, and stealing him away from a rival company to become his chief designer. He also stirred up controversy about Times New Roman, insisting that the original designs for it, by Starling Burgess, had been stolen from him in the 1920s. In 2009 he launched a type called Starling, based on those designs, to make his point; it was Times New Roman to the life, but better.

Of the more than 1,000 types he developed, his greatest success was Helvetica. It was he who adjusted it, or corralled it, to the needs of the obdurate, cranky, noisy Linotype machines which then printed almost everything in America. Originally it was the brainchild of a Swiss designers, Max Miedinger, who devised it in 1956. In contrast to the delicate exuberance of 16th-century types, Helvetica was plain, rigidly horizontal—and eminently readable. It became, in Mr Parker's hands, the public typeface of the modern world: of the New York subway, of federal income-tax forms, of the logos of McDonald's, Microsoft, Apple, Lufthansa and countless others. It was also, for its clarity, the default type on Macs, and so leapt smoothly into the desktop age.

Not everyone liked it. He did not always like it himself: as he roared around Brooklyn or Boston, opera pumping out at full volume from his car, he would constantly spot Helvetica being abused in some way, with rounded terminals or bad spacing, on shopfronts or the sides of trucks. But far from seeing Helvetica as neutral, vanilla or nondescript, he loved it for the relationship between figure and ground, its firmness, its existence in "a powerful matrix of surrounding space". Type gave flavour to words: and this was a typeface that gave people confidence to navigate through swiftly changing times.

He rode them pretty well himself, leaving Linotype in 1981 with Mr Carter to found Bitstream, the first company dedicated to producing digital fonts that could be licensed for use by anyone. A partnership with Steve Jobs never quite happened and, in 1995, cost him his shirt; but he remained delighted by the typesetting possibilities of the digital age, in which whole pages could be set at the touch of a button, and thousands of fonts browsed and deployed by one person sitting at a desk.

As type historian for the Font Bureau in his later years, he liked to muse that typesetting had moved at a Procrustean pace between Gutenberg and the late 19th-century Linotype machine. But—cue for a broad, twinkling smile—he had been lucky enough to live and work in the latter half of the 20th century, an age of light-swift revolution generated, once again, by type. ■

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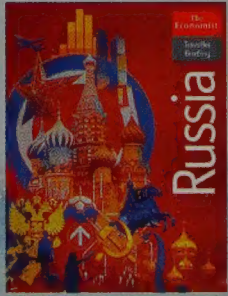
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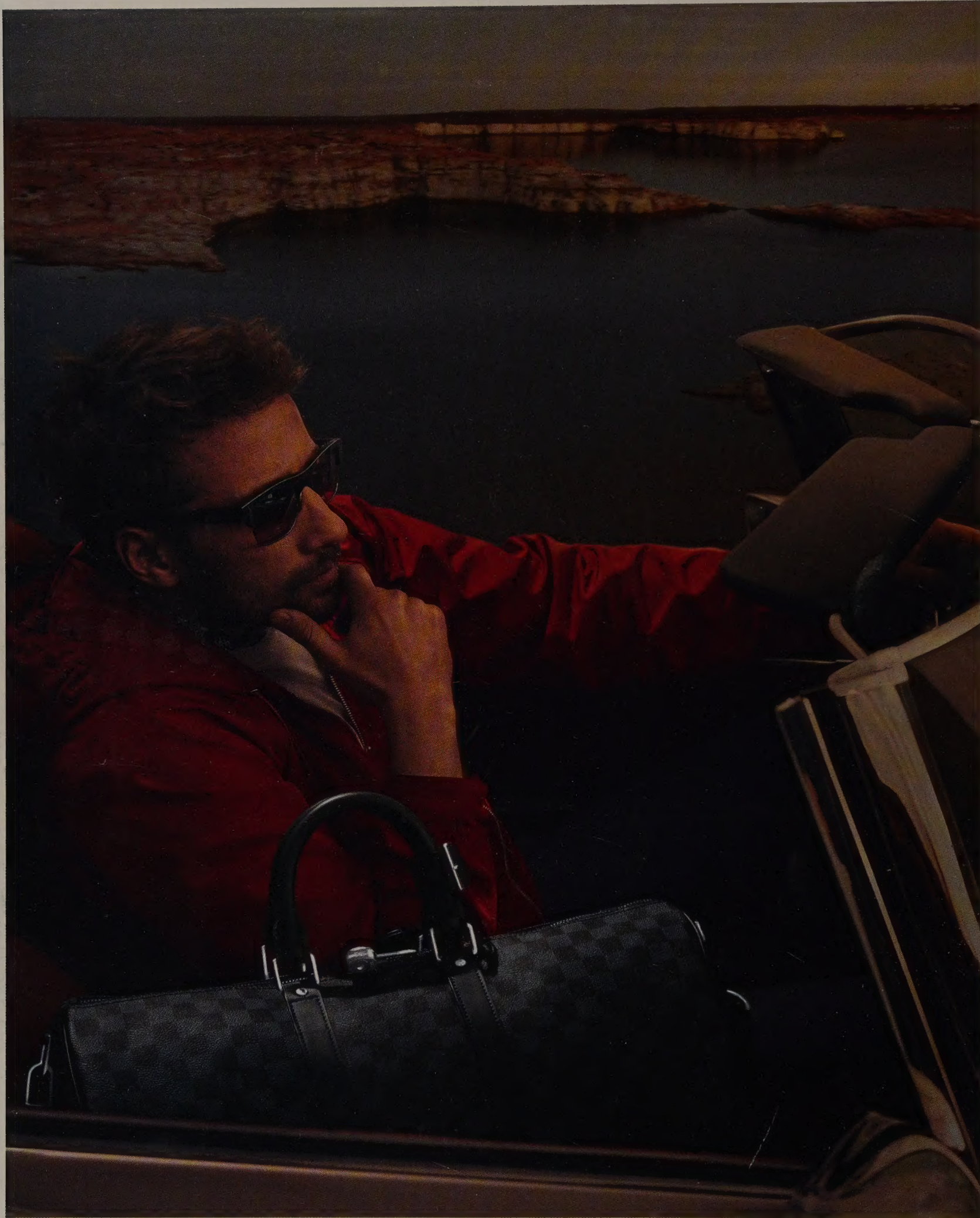


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